VOL. IV. JULY, 1894. NO. 4.

THE MONIST.

THE IMMORTALITY THAT IS NOW.

'TIS said that memory is life,
And that, though dead, men are alive:
Removed from sorrow, care, and strife,
They live because their works survive.
And some find sweetness in the thought
That immortality is now;
That though our earthly parts are brought
To re-unite with all below,
The spirit and the life yet live
In future lives of all our kind,
And, acting still in them, can give
Eternal life to every mind.

The web of things on every side
Is joined by lines we may not see;
And, great or narrow, small or wide,
What has been governs what shall be.
No change in childhood's early day,
No storm that raged, no thought that ran,
But leaves a track upon the clay
Which slowly hardens into man;
And so, amid the race of men,
No change is lost, seen or unseen;
And of the earth no denizen
Shall be as though he had not been.

GEORGE JOHN ROMANES.

GEORGE JOHN ROMANES.

IN MEMORIAM.

GEORGE JOHN ROMANES, the great English naturalist, upon whom, it was said, the mantle of Darwin fell, died on May 23, in the prime of manhood. We are deeply moved at the sad news, and feel his death as our personal loss, for he was not only closely connected with us but had also repeatedly expressed a strong sympathy with the aims of our publications. He contributed articles to both *The Open Court* and *The Monist*, partly in reply to distinguished critics of his works, as F. Max Müller and Alfred Binet, partly as the spirit prompted him to write. Also the American editions of his works "Darwin and After Darwin" and "Weismannism" were brought out by The Open Court Publishing Co. He cordially responded to our call when we asked his aid in bringing out *The Monist*, and the opening article of the first number was from his pen.

Professor Romanes was one of those rare combinations in whose minds a deep religious sentiment and poetical genius are combined with a powerful scientific comprehension. His conviction of "the immortality that is now," is beautifully expressed in the lines published on the first page of this number.* His faith was of a peculiar compass, for his mind was broad enough to harbor, along with a purified Christianity, a philosophy based upon a rigorous investigation of the facts of nature.

EDITOR.

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* They have been selected from a memorial poem addressed to Charles Darwin, embodied in a volume printed for private circulation among his friends.

The frontispiece of the present number is made from a reduction of a large picture which was added in 1892 to the National Portrait Gallery of the British Museum.

THE NON-EUCLIDEAN GEOMETRY INEVITABLE.

IN saying that, at a certain stage of civilisation or general mental enlightenment, the doctrine of the conservation of matter appears of necessity, nothing need be maintained about the finality of that doctrine.

So also in regard to the conservation of energy. When general science and precision of measurement had reached a certain stage of development, a certain perfection, this question of the seeming disappearance of accurately estimated energy could no longer be overlooked. The amount of conscious or unconscious dodging required to avoid this consideration becomes too laborious, and Mayer, Colding, Grove, Helmholtz, Joule, and a host of others find the doctrine of the conservation of energy forced upon them.

Again, without considering as irreducible this foundation-stone of science, we can see that it makes untenable the realistic materialism for which the brain secretes thought as the liver secretes bile; and equally untenable the Scotch realistic dualism of an immaterial soul using the brain.

For suppose all the natural forces of the universe so constituted and connected that one may pass into another in accordance with certain definite ratios of equivalence, such as Joule's mechanical equivalent of heat, but that, so reckoned, they can neither be increased nor diminished as a whole, any more than can the finite amount of matter.

If, now, mind is a piece of the material world; if what we call mental energy, while mental, is yet a part of the sum of physical energy, then some of this invariable quantity of energy exists from time to time as mental energy, and so we would expect to be able to

say that a certain amount of chemical energy disappears, but reappears as mental energy, or perhaps disappears as mental energy but reappears as mechanical energy or heat. But the absolute tests of science would demonstrate that such is never the case. No bit of physical energy ever disappeared as physical energy to become even for an instant mental energy. There is not a single point in the series of changes which take place in the brain at which all the energy is not in actual existence as physical energy. There is not a point where anything of the nature of thought could be inserted as a possible link in the chain of transformations of energy. Materialism and dualism are equally impossible. Idealistic monism becomes inevitable. Thinking mathematicians have long known that number is wholly of human make, and agree that the idea of time has no essential connexion with it. The question of the subjectivity of space is as natural as the question of the actual existence of boundaries. I was an interested listener to a debate, between a chemist and a metaphysician, as to the existence of a boundary between the black and the white half of a surface which was before them. The chemist said he thought of the white part, and then of the black part, but never of anything between them. To him the idea of a boundary absolutely without any breadth, and belonging as much to the white as to the black, appeared highly artificial, and utterly uncalled for. To the metaphysician the common boundary, the line between the white and black, appeared more real than the colors it bounded. The line without width was just what his mind took hold of, and dwelt upon.

Is geometry then as wholly subjective as is arithmetic? It has been a product of pure logic applied to certain fundamental properties attributed primarily to the straight line, secondarily to the plane, circle, and sphere. But whence these properties, these lines, these surfaces? If we can agree upon these will all be settled?

Can any one give a descriptive definition of a straight line or a plane? Euclid's fourth definition is "A line which lies evenly between the points in itself is a straight line." His seventh is "A surface which lies evenly between the straight lines in itself is a plane."

I would paraphrase this: A straight is a line which looks the same from every point not in it. A plane is a surface which looks the same from every point not in it. But for the work of demonstration, Euclid substitutes for his pseudo-description a theorem "Two straight lines cannot enclose a space." We paraphrase this by saying, A straight is a line determined by any two points in it. But just here an interesting question has suggested itself to my mind: "Does not this modern paraphrase fail to touch one tremendously important matter covered by Euclid's Sixth Postulate? [P. Tannery gives as Postulate 6: "*Et que deux droites ne comprennent pas d'espace.*" (Axiom 12 in Gregory; Axiom 9 in Heiberg).]

Space may be homogeneous and boundless (though not infinitely great), and straights may be homogeneous and boundless, and look the same from every point not in them, and each be determined by any two points in it; and yet each may be finite and all may be equal in size. But Euclid's Sixth Postulate assumes in addition that straights are not finite, since if finite and boundless two must recur to any crossing-point, and so would "enclose a space" in Euclid's sense. Did Euclid build so much better than he knew? Or was he conscious of that truth which in modern times waited for Riemann, that space may be boundless, yet finite in size?

When the French Revolution had beheaded all adherence to authority, when even the years and the months were renamed, in the *séance de l'école normale du 26 pluviose an III*, the celebrated Fourier proposed new definitions of the sphere, plane, circle, straight, as foundation for a new treatment of the beautiful science of space.

Take any two points on any solid. Let one remain at rest while the solid moves. The other describes a sphere. Two spheres intersect in a circle. If the spheres are equal and grow, this circle describes a plane. If the spheres touch and one decreases as the other grows, their point of contact describes a straight.

Monge, that delicate spirit, founder of the idea of elegance in demonstration, was present, and suggested certain objections to the views of Fourier, but neither seemed to suspect that these defini-

tions, however perfect, conduct not to Euclidean geometry, but to pangeometry.

How had Euclid managed not only to bury this immortal double-ghost of his space, but to conceal the grave for two thousand years? Euclid did not try to hide the non-Euclidean geometry. That was done by the superstitious night of the fanatic dark ages, from which night we have finally emerged, to find again what Euclid knew.

I believe the Euclid of twenty centuries before the birth of Gauss could still have taught the Gauss of 1799. Let us see. At the end of that year Gauss from Braunschweig writes to Bolyai in Klausenburg as follows:

"I very much regret that I did not make use of our former proximity to find out *more* of your investigations in regard to the first grounds of geometry; I should certainly thereby have spared myself much vain labor, and would have become more restful than any one such as I can be, so long as, on such a subject, there yet remains so much to be wished for. In my own work thereon I myself have advanced far (though my other wholly heterogeneous employments leave me little time therefor), but *the* way, which I have hit upon, leads not so much to the goal which one wishes, as much more to making doubtful the truth of geometry. I have hit upon much which, with most, would pass for a proof, but which in my eyes proves as good as nothing. For example, if one could prove that a rectilineal triangle is possible whose content may be greater than any given surface, then am I in condition to prove with perfect rigor all geometry. Most would indeed let that pass as an axiom; I not; it might well be possible, that, how far apart soever one took the three vertices of the triangle in space, yet the content was always under a given limit. I have more such theorems, but in none do I find anything satisfying."

From this letter we see that in 1799 Gauss was still trying to prove that Euclid's is the only non-contradictory system of geometry, and that it is the system regnant in the external space of our physical experience. The first is false; the second can never be proven. For, strangely enough, though nothing renders it impossible that the space of our physical experience may be this very year satisfactorily shown to belong to Lobatschewsky or to Riemann, yet the same is not true for Euclid. To decide our space is Lobatschewsky's, one need only show a single rectilineal triangle whose angle-sum measures less than a straight angle. A single rectilineal triangle with angle-sum greater than a straight angle would give all

our space to Riemann. And either of these could be shown to exist by imperfect measurements, such as human measurements must always be. For example, if our instruments for angular measurement could be brought to measure an angle to within one millionth of a second, then if the lack or excess in the angle-sum were as great as two millionths of a second, we could make certain its existence.

But to prove Euclid's system, we must show that this angle-sum is *exactly* a straight angle, which nothing human can ever do. Euclid himself tried his own calm, immortal genius, and the genius of his race for perfection, against this angle-sum. The benign intellectual pride of the founder of the mathematical school of the greatest of universities, Alexandria, would not let the question cloak itself in the obscurities of the infinitely great or the infinitely small. He said to himself: "Can I prove this plain, straightforward, simple, if somewhat inelegant theorem: If a straight line meeting two straight lines, make those angles, which are inward and upon the same side of it, less than two right angles, the two straight lines being produced indefinitely will meet each other on the side where the angles are less than two right angles." [Williamson's translation; Postulate 5, P. Tannery and Heiberg, Axiom 11 in Gregory.]

And let not the twentieth-century-American, in the insolence of his newness, underestimate the subtle power of that old Greek mind. The Chicago Fair produced no Venus of Milo. Euclid's own treatment of proportion is found as flawless in the chapter which Stolz devotes to it in 1885 as when through Newton it first gave us our present continuous number-system.

But what fortune had this genius in the fight with its self-chosen simple theorem? Was it found to be deducible from all the definitions, and the nine "Common Notions" and the five other Postulates of the immortal Elements? Not so. But meantime Euclid went ahead without it through twenty-eight propositions, more than half his first book. But at last came the practical pinch, then as now the triangle's angle-sum. He gets it by his twenty-ninth theorem: "A straight falling upon two parallel straights makes the alternate angles equal." But for the proof of this he wants that recalcitrant proposition which has so long been keeping him awake

nights and waking him up mornings. One last struggle, and then, true man of science, he acknowledges it indemonstrable, and spreads it in all its ugly length among his postulates.

But just here the modern translators miss a most charming point. With inartistic dullness, (see, e. g. Todhunter's), they cite in proposition twenty-nine the whole repulsive Postulate 5. But Euclid's delicate genius revolted at the very moment of transcription, and what he actually wrote down was something entirely different and much more elegant, rendered thus by Williamson, 1781: "those [straights] which are produced indefinitely from less than two right angles meet."

The Greek who dared answer to great King Ptolemy, "There is no royal road to geometry," dared carry out for himself the beautiful system of geometry which comes from the contradiction of his indemonstrable postulate; which exists if there be straights produced indefinitely from less than two right angles yet nowhere meeting. Moreover, since Schiaparelli has restored the astronomical system of Eudoxus, and Hultsch has published the writings of Autolycus, we see that Euclid knew surface-spherics, was familiar with triangles whose angle-sum is more than a straight angle.

Of how inevitably the three systems of geometry flow from just exactly the attempt Euclid made, the attempt to demonstrate his postulate fifth, we have a most romantic example in the work of an Italian priest, Saccheri, who died the fifth of October, 1733. He was a Jesuit of San Remo, who commenced to teach at Pavia in 1697, and died at Milan, where he directed the Collegio di Brera. He studied Euclid in the edition of Clavius, where the fifth postulate is given as Axiom 13. Saccheri says it should not be called an axiom, but ought to be demonstrated. He tries this seemingly simple task; but his work on it swells to a quarto book of 101 pages, four pages of index, and forty-eight figures; and with all that, he finds not a demonstration of the postulate, but, instead, three different systems of geometry.

His first proposition is: "I. In a quadrilateral $A\,B\,C\,D$, right-angled at A and B, and with opposite sides $A\,C$, $B\,D$ equal, the angles at C and D are equal." Then, after three more propositions

and three corollaries, he says: "Definitions. There are three hypotheses to distinguish, according to the nature of the angles *C* and *D* in proposition I: *hypothesis anguli recti, hypothesis anguli obtusi, hypothesis anguli acuti.*"

His propositions V, VI, VII are, that if either hypothesis is true in a single case, it is so always.

VIII–IX. In a right-angled triangle the sum of the oblique angles is equal to, greater than, or less than, a right angle, according as the hypothesis is *anguli recti, anguli obtusi, anguli acuti.*

XI–XII. In the first two hypotheses a perpendicular and an oblique to the same straight will meet.

XIII. In these two hypotheses Euclid's Postulate 5 is true.

XV–XVI. According as a triangle's angle-sum is equal to, greater than, or less than, a straight angle, we have *hypothesis anguli recti, obtusi, acuti.*

XVII. With hypothesis *anguli acuti* we can draw a perpendicular and an oblique to the same straight which nowhere meet. (Two solutions given.)

Let this suffice as a specimen of Saccheri's marvellous quarto. Clifford loved the hypothesis *anguli obtusi.* That great astronomer and geometer Sir Robert Ball actually believes in it. But Saccheri, like our profound American mathematician, Professor Oliver of Cornell, was powerfully drawn to the *hypothesis anguli acuti.* He fully realised the momentous consequences involved; nothing less than a new conception of nature, less mechanical than Newton's, and for a Catholic priest beyond question *unorthodox.* "He confessed to a distracting heretical tendency on his part in favor of the *hypothesis anguli acuti,* a tendency against which, however, he kept up a perpetual struggle (*diuturnum proelium*)."

The Inquisitor-general and the Archbishop of Milan saw Saccheri's book on July 13, 1733; the Provincial of the Company of Jesus on August 16, 1733. Within less than two months Saccheri was dead and buried. Not so his book. It was reviewed in the "Acta Eruditorum" in 1736. It was probably in the library at Göttingen about 1790–1800, for it is marked with an asterisk in the "Bibliotheca Mathematica" of Murhard. In this work it is signal-

ised (T. II, p. 43) among the writings consecrated to the explication, to the criticism, or to the defence of Euclid ("Einleitungs- und Erläuterungsschriften, auch Angriffe und Vertheidigungen des Euklides"). It therefore attained a certain notoriety. Did it escape the notice of Gauss? Jacobi, writing to Legendre, accuses Gauss of spreading a veil of mystery over his work.

Now, in the generation just preceding Gauss there worked a person so extraordinary that even Kant calls him *"der unvergleichliche Mann,"*—John Henry Lambert. He was the originator of Symbolic Logic. He fully recognised that the four algebraic operations, addition, subtraction, multiplication, division, have each an analogue in logic, namely, *Zusammensetzung, Absonderung, Bestimmung, Abstraction,* which may be symbolised by $+$, $-$, $\times$, $\div$. He also perceived the *inverse* nature of the second and fourth as compared with the first and third. He enunciates with perfect clearness the principal logical laws, such as the commutative and the distributive. He *develops* simple logical expressions precisely as Boole did later. He interpreted and represented hypothetical propositions precisely as Boole did. In one passage at least he recognised that the inverse process, marked by division, is an *indeterminate* one. Venn says: "To my thinking he and Boole stand quite supreme in this subject in the way of originality."

The problem of the arithmetical quadrature of the circle is as old as mathematics. Lambert it was who first proved the task of the π-computers endless by demonstrating that π is irrational. This alone would have made him immortal. He developed De Moivre's theorems on the trigonometry of complex variables, and introduced the hyperbolic sine and cosine, denoted by the symbols $\sinh x$, $\cosh x$. Now, the development of the theory of complex variables is one of the chief claims of Gauss.

In the very short and imperfect sketch of Lambert by F. W. Cornish of Eton College inserted in the "Encyclopædia Britannica" in 1882 we read:

"In Bernouilli and Hindenburg's *Magazin* (1787–1788) he treats of the roots of equations and *of parallel lines.*"

From the deepest analytical mind of his generation that could only mean the non-Euclidean Geometry. The essay, "Zur Theorie der Parallellinien," was written in September, 1766, but first published in 1786 by F. Bernouilli (a kinsman of John Bernouilli) from the papers left by Lambert, and appears in the *Leipziger Magazin für reine und angewandte Mathematik*, herausgegeben von J. Bernouilli und C. F. Hindenburg, erster Jahrgang, 1786, Seite 137 ff. It is so important that the Leipziger Gesellschaft der Wissenschaften are about to issue a reprint of it in their Abhandlungen.

In this remarkable work Lambert maintains:

1) The Parallel-Axiom needs a proof since it does not hold for the geometry on a sphere.

2) In order to bring before the perceptive intuition a geometry in which the triangle's angle-sum is less than two right angles, we need the help of an "imaginary sphere."

3) In a space in which the triangle's angle-sum is different from two right angles, there is an absolute measure [a natural unit for length].

The rare copies which exist of W. Bolyai's "Tentamen Juventutem," such as that sold by Friedländer in 1884 at 120 marks, are dated 1832–1833. But W. Bolyai, in his "Kurzer Grundriss" (1851) speaks of it as "einem lateinischen Werke von 1829." In this "Latin work" he gives, attributing it to his son John, the expression for a circle in terms of its radius by means of π, e, and this natural unit.

In July, 1831, Gauss, in a letter to Schumacher, gives precisely this formula.

In 1829 Lobatschewsky published the elements of his non-Euclidean geometry in the Kasan *Messenger*.

In 1831 we see Schumacher using the hypothesis "if the geometry of Euclid be not true," and Gauss tells him later that "a certain Schweikardt has given to this geometry the name of *astral geometry*."

In 1846 Gauss writes that he had reread Lobatschewsky's "Geometrische Untersuchungen," and that "the exposition is totally different from that which I had projected."

In this very year Philip Kelland began to teach the non-Euclidean geometry to classes in the University of Edinburgh. In his paper on the subject, read December 21, 1863, before the Royal Society of Edinburgh, he says: "For the last seventeen years I have made it the repeated subject of lectures and essays in my class." Further on he says:

"Some years ago there appeared in *Crelle's Journal* a notice of a work, entitled 'Imaginary or Impossible Geometry,' viz., a discussion of the conclusions which would follow from the assumption as an axiom of the hypothesis that 'the three angles of a triangle are together less than two right angles.' I have never met with any statement of the propositions which the author deduced from this hypothesis."

I take these "some years ago" to be less than "seventeen years," and Kelland to be an independent discoverer of the inevitable non-Euclidean geometry.

Even the newness of America did not prevent our having an independent discoverer of the inevitable, namely, Prof. G. P. Young, the title of whose paper is: "The Relation Which Can Be Proved to Subsist Between the Area of a Plane Triangle and the Sum of the Angles, on the Hypothesis that Euclid's Twelfth Axiom Is False." Read before the Canadian Institute, February 25, 1860. Published in the *Canadian Journal of Industry, Science, and Art*, New Series, Vol. V, 1860, pp. 341–356. He says:

"I propose to prove in the present paper that if Euclid's Twelfth Axiom be supposed to fail in any case, a relation subsists between the area of a plane triangle and the sum of the angles. Call the area A and the sum of the angles s; a right angle being taken as the unit of measure. Then $A = k(2 - s)$; k being a constant finite quantity, that is, a finite quantity that remains the same for all triangles. This formula may be considered as holding good, even when Euclid's Twelfth Axiom is assumed to be true; only k is, in that case, infinite."

J. C. Glashan of Ottawa, Canada, assures us that "this paper was drawn up without the slightest knowledge whatsoever that anything had ever before been written or spoken on the subject."

The proof, which is in the style of Euclid, is thoroughly elementary, even more so perhaps than Bolyai's, and, like his, is applied to but two of the three geometries of space of constant curva-

ture; the assumption of Euclid's Sixth Postulate in the very first proposition, shutting out elliptic geometry. Omitting this proposition, the proof is easily extended to pangeometry.

In 1877 Grassmann pointed out that his "Ausdehnungslehre" of 1844 contained a complete foundation for an analytical development of non-Euclidean spaces. He gives as an example the "spherical space of Helmholtz." He mentions also Riemann's "Probevorlesung" of 1854, of which Dedekind thus describes the effect on Gauss:

"Nun setzte ihn die Vorlesung, welche alle seine Erwartungen übertraf, in das grösste Erstaunen, und auf dem Rückwege aus der Facultäts-Sitzung sprach er sich gegen Wilhelm Weber mit höchster Anerkennung und mit einer bei ihm seltenen Erregung über die Tiefe der von Riemann vorgetragenen Gedanken aus."

Here let us pause. Our thesis is more than established. But of the many who have shown the non-Euclidean geometry *mechanically* inevitable, let me mention just one, that great astronomer and geometer, Sir Robert Stawell Ball, who wrote of late:

"I quite agree with you as to the importance and the interest of the subject. The developments which it suggests are truly astonishing. It is also noteworthy how many mathematicians, approaching the subject from very varied sides, have been led to the study of what mathematics would be like without the eleventh axiom."

And now what is the final outcome, judged from the highest standpoint, that of a pure, fearless philosophy? It is nothing less than a new freedom to explain and understand our universe and ourselves.

GEORGE BRUCE HALSTED.

AUSTIN, TEXAS.

PROF. ADOLF HARNACK ON THE RELIGION OF SCIENCE.

THE *Outlook* of April 28, 1894, contains an article by Prof. Adolf Harnack, entitled "Pro Domo," in which he replies to a review of his "Outlines of the History of Dogma," which appeared under the signature of Merwin-Marie Snell in *The Monist* for January, 1894. The Professor states that "the criticism in *The Monist* gives a fairly detailed account of the contents of the book," but he resents bitterly a few comments which he understands to involve a charge of duplicity. The reviewer remarks that Professor Harnack reverses the pretensions and merits of most other books on religious history. They profess to be impartial, though they are really *ex parte*, while Professor Harnack's work is characterised by an obtrusive affectation of partisanship though in reality it is perfectly fair and judicial. This, in Professor Harnack's interpretation, means "the book is honest, the author is dishonest." Lest any injustice be done to Professor Harnack in the columns of *The Monist*, I have taken the pains to investigate the case. As it is natural that a fearless investigator of ecclesiastical history who professes to be a Christian, will always by his orthodox brethren be accused of equivocation because a faithful believer must, in their opinion, bring into captivity every thought, I can understand the sensitiveness of the Professor on this delicate point, the more so as we learn from an editorial note of the same number of the *Outlook* (pp. 737–738) that he is of a "nervous temperament," but I can assure him that the reviewer, whom I have personally questioned on the subject, had not the slightest intention of throwing the least shadow of doubt upon his honesty.

Professor Harnack, however, does not merely speak *pro domo*, but also makes an assault on the position of *The Monist*: he not only repudiates the supposed charge of hypocrisy but retorts at the same time with an unwarranted attack upon the Religion of Science. I shall discuss his reply not for the purpose of offsetting his *pro domo* by a *pro domo* of mine, but in order to elucidate the problem which is the common object of our investigations. I should be glad to drop all personal matters and confine myself to a brief exposition of Professor Harnack's theology in the light of the Religion of Science, but I trust that a few words of explanation will convince Professor Harnack that the arguments which he supposes to have determined the judgment of his reviewer are inapplicable. Professor Harnack solves the problem which presents itself to his mind, "How did the critic reach the slanderous accusation?" in the following way. He says:

"Simply because he is unable to imagine that a man who candidly examines history can believe in the living God, and find and recognise him in Jesus Christ. To him such faith is absurd, and, hence, it appears inconsistent with sound learning. If, now, he finds in a book sound learning and this faith, he is obliged to conclude that the author, either in the one respect or the other, is a hypocrite. But since one cannot feign sound learning, it must be that the faith is feigned. *Tertium non datur.*"

Before I enter into a discussion of the main subject, which is a comparison of Professor Harnack's theology and the Religion of Science, I wish to make a few personal remarks. The reviewer, Mr. Merwin-Marie Snell, must not be identified with the editorial management of *The Monist*. Our contributors and reviewers are by no means (as Professor Harnack apparently assumes) expected to represent the standpoint of the magazine; they are free men and express their private opinions under their own signature, making the editor, however, in so far coresponsible for what they say, as he accepts their articles for publication. Whether or not Mr. Snell professes the Religion of Science is not for me to say, but judging from a late article of his in the *Non-Sectarian*, I am inclined to think that however much he may be in sympathy with it, he does not make it his own faith. Mr. Snell's position is quite peculiar. Son of a Protestant clergyman, he became a convert to Catholicism and was

for several years secretary to Bishop Keane of Washington. He left the church about two years ago and has of late allied himself with the Unitarians; but while, in agreement with the Religion of Science, he adopts the principle of free investigation, he still cherishes in his heart a peculiar love of Romanism on account of its rites and institutions. Professor Harnack will understand the review better if he considers the character of his reviewer. The very passages of which Professor Harnack complains show traces of Mr. Snell's Catholicism —not of rationalism.

Mr. Snell, like many Catholics, has a grudge against St. Augustine whose theology he regards as a retrogression and as the basis of obscurantism. He believes that the Roman Church allows more freedom than the Lutheran Church and attributes the narrowness of the latter to the influence of St. Augustine. Thus the more he admires the progressive spirit of Professor Harnack, the more is he pained to find Professor Harnack constantly singing the praises of the Latin father. In this sense Mr. Snell says:

"Most thinking men will not partake of the Augustinian and Evangelical sympathies strongly and openly expressed by Dr. Harnack in many places throughout his book; and it is more than questionable whether the Harnack of the closet is in accord with the Harnack of the rostrum."

Mr. Snell means that Professor Harnack's modes of thought are anti-Augustinian while his utterances exhibit an undue overestimation of Augustine. We do not care to decide between Mr. Snell's "Catholic" underestimation of St. Augustine and Professor Harnack's "Evangelical" overestimation; we simply state that (as the context shows in which this paragraph appears) Professor Harnack has misinterpreted the passage.

There is another misunderstanding which rises from the same source. Professor Harnack says:

"Luther did away with the old dogmatic Christianity and put a new evangelical conception in its place. The Reformation is in reality an exit of the history of dogma." (P. 556, Engl. tr.)

There are few Lutherans even now who would assent to Professor Harnack's conception of Lutheranism, and I myself can only agree with Professor Harnack, if he modifies this statement so as

or account for. Science must catch up with religion and must learn to decipher the grand utterances of Jesus of Nazareth, and to do this is the sole object of all theological scholarship and of the philosophy of religion. Many are diffident and say it cannot be done, but we say it must be done; man's rational nature impels him to do it; and it is his highest duty to understand the nature of his religious ideals.

The great facts of history are repeated in our daily experience. Who of us has not, long before his intelligence developed into full maturity, on various occasions dimly felt the correct solution of moral problems? As there is a life-preserving instinct in the world of lower animals, so there is a soul-quickening moral instinct in man which is mystically experienced. Professor Harnack seems to believe that our mystical experiences cannot or should not be subjected to scientific analysis. If this is his position, we differ from him; if not, how can he arraign the Religion of Science as profitless?

Professor Harnack may regard the Religion of Science as rationalism; and in a certain sense it is rationalism, but in another sense it is not. It all depends whether we mean by rationalism simply a free exercise of man's reason, or that historical movement which attempted in a most prosy way to rationalise the religious traditions of Christianity. On the one hand, we do not say that man can be saved by reason and by reason alone, for man must work out his salvation with diligence; he must be active and energetic, and in order to continue in his work he must have the enthusiasm of faith and a holy zeal for the cause of truth. Reason is only one side of man's being, and we are not blind to the existence and importance of other sides. But on the other hand we say, Give unto reason what is reason's; hand over to rational inquiry the whole field of your experiences, external as well as internal, and investigate the bottom facts from which develop such religious ideas as God, soul, and immortality. There is truth in all of them, and you will find that a real, thorough comprehension of your religious notions will always tend to deepen them, and will show truth in a higher significance and a nobler sublimity. For truth is greater than all mythologies.

to say that the Reformation introduced into the history of the Church an element which in its further evolution could not but bring about an abolition of dogma. But he must not be blind to the fact that there is plenty of dogmatism in all the Lutheran churches. That Mr. Snell resents Professor Harnack's proposition to lay all the evils of dogmatism at the door of the Roman Church and claim an indemnity for the Lutheran Church, is but natural, although he had better suppressed the remark as to his "suspicion that the history of dogma in the churches of the Reformation is excluded because it is too delicate a subject to be handled with safety under the auspices of the State Church of Germany."* The administration of the State Church of Prussia exercises upon the theological faculties an indirect but strong influence which by no means favors the spirit of free inquiry. That under such conditions German professors are careful in their expressions to avoid all unnecessary offence is but a matter of course. Professor Harnack urges that he personally is untrammelled, "for," says he, "no promise [to defend and teach the Lutheran religion] was exacted from me when I entered the faculty;"† and he adds, that the provision of the Prussian State law is "Science and instruction in science shall be unfettered." As to the latter we know the law and also its execution. It is true that the life, living, and personal liberty of a professor are not endangered, but his activity can be rendered uneffective, he can be spiritually killed, he can even be urged to quit the theological faculty. I need not mention instances for Professor Harnack will know them better than I do; but I know whereof I speak. There is no use in denying the annoyances to which Bible criticism is exposed in Germany. Professor Harnack himself had his full share of them. Nor is there any reason for German theologians to resent a public mention of this

* Mr. Snell should have said either the several "State Churches of Germany," or "the State Church of Prussia." There is no "State Church of Germany."

† (1) I understand this sentence to mean that "no vow was ever exacted from Professor Harnack." (2) We omit to mention Professor Harnack's remark—that "the faculty is not Lutheran, but a Union of Lutheran and Reformed,"—firstly because we are at present not concerned with the difference between Lutherans and Reformed, and secondly because the Union was made under the explicit stipulation that the confessions of both denominations should remain unaffected.

calamity, for they cannot be blamed for the misapplied paternalism of the ecclesiastical authorities of their country. On the contrary, they must the more be honored. Any one familiar with the situation will join me in expressing my unreserved admiration for the manhood of German theologians who, as a fact, are unrivalled in the wide world for their thoroughness and fearlessness. The flourishing condition of German criticism under externally most unfavorable conditions reminds one of the palm-tree which, when under the pressure of a heavy burden, only grows the statelier and nobler. There is plenty of piety in England and America, but where more than in Germany is piety closely allied with that love of truth which shows itself in an undaunted criticism even of the venerable and dearly beloved sacred writings?

In giving these explanations, I do not mean to say that I should have used Mr. Snell's expressions or that I make them my own; I only elucidate their meaning and the sense in which I want them to be understood. In glancing over his remarks I find several things to which I would take exception.

But now I have to turn the tables and ask Professor Harnack on what ground he imputes to a man whose faith is the Religion of Science the narrowness of regarding all thinkers of a different stamp as "fools or hypocrites"? Professor Harnack demands of a critic "to make an attempt to understand the author's meaning before he tears him in twain." This is good ethics, but does he practise what he preaches? Confusing the reviewer of his book with the editor of *The Monist*, Professor Harnack makes a sally at the Religion of Science. He says:

"I will help my critic a little. According to his idea—and, alas! he is supported in this by some Christians, as we shall see in our second section—the Christian faith appeals to a collection of ancient writings, which are held as sacred and inerrant, to a mass of miracle-narrations, and to a childish conception of the universe and of man. If, now, it is proved that these writings contain errors, that the miracle-narrations are not wholly credible, and that the universe is not such as it was at one time regarded, then faith falls to the ground. Further, the critic is of the opinion that there is a 'Religion of Science,' which can be deduced from an observation of the system of the universe and of the laws of motion; and that this is the only religion. Finally—and this is his chief thought—he believes that all the

phenomena of nature and of history are to be explained through the 'Evolution des Einen' (Evolution of the Monad). I should rejoice if I were mistaken, but I presume that I am not.

"Now, as regards all these doctrines, I hold other views. I believe that the Christian religion still shines just as brightly as formerly, although its books no longer appear inerrant, its miracle-narrations fall, and its old cosmology is destroyed. For the Gospel—that is, the Christian religion—has only *one* aim: that the soul may find its God, and cleave to him in humility and love; and it promises to those who love Jesus Christ, and follow him, that they *shall find God.* Further, a "Religion of Science" is to me a wholly indistinct conception, with which I do not know what to do. I know only of a religion which gives a peace higher than all reason, therefore also higher than all science; and I know only of a religion which is mystically experienced by us, and which receives its confirmation, not from the course of nature, but from conscience and history. Finally, of an 'evolution' I also can speak; but I do not pretend to have found the unity of nature and of spirit, of the realm of gravitation and the realm of moral worth. I believe that they also have their unity; not, however, in an Unknown, but in the living God. However, I can make little use of this faith in the scientific investigation of nature and history. Each of these realms has its peculiar laws. They are deeply involved each in the others; but of what assistance can the science of nature be to me, if I wish to find out to what *persons* our present humanity is most indebted for those powers of faith and conscientiousness, of love and sacrifice, of courage and industry, and when I reflect upon the question as to how these powers are constantly sustained for us? The principle of evolution I also seek to apply wherever its application seems to me possible; but I am not able to include personality and ethics therein, and I am sure that the mysterious Being who rules heaven and earth reveals himself to us in *humanity.* Here he has not left himself without a witness; and from this starting-point I also seek to understand Jesus Christ—the Son of God among the children of God. By my critic this is regarded as an exploded theory of the world. I believe, however, that it more nearly corresponds to the facts which we see about us than does his. In any case, his theory imposes a heavy penalty upon him—he is obliged to regard all who believe in the living God, and find him in history, as either fools or hypocrites. I am in a more favorable position; I hold my opponent to be neither a fool nor a hypocrite, but a misguided man."

Professor Harnack has been bitterly accused in German theological magazines on account of his opinion on the Apostolicum. He was denied the right of calling himself a Christian,* so that I

* It is usually held that a clergyman whose world-conception has broadened under the influence of science must leave the church. We contend that it is his duty to stay. The question is ventilated in an editorial of *The Monist* (Vol. II. No.

wished at the time I could jump to his assistance; and now I find him, in whom I had hoped to find an ally, in full armor against me.

We, the editors of *The Monist*, are in a similar predicament to Professor Harnack. The believer in the letter on the one side decries us as atheistic, while the iconoclast on the other side calls us time-servers, because we continue to use the words God and religion, although in a purified sense and with a deeper meaning.

I am at a loss to account for the sources of Professor Harnack's information concerning the Religion of Science. Mr. Snell's review contains no trace of it. He mentions the Religion of Science once in connexion with the Alexandrian school, but in an indifferent manner. Professor Harnack apparently opens a broadside fire upon the idea of a Religion of Science in general. But why and for what purpose? He fights in the dark. Where can he find in any one of our publications such views on Christianity as he here imputes to the Religion of Science? Let him quote the passage in which the Christian faith has been said to appeal to a childish conception of the universe and of man. The readers of *The Monist* will know how wide of the mark Professor Harnack's comments are; I do not think it necessary to refute them.* Be it sufficient here to say that Religion of Science is not the name of a sect; it does not denote a visible but the invisible church. It characterises a certain religious attitude which may be found among men of various denominations. "Religion of Science" means Religion of Truth, Truth being ascertainable according to the methods of scientific inquiry. Truth being a much misapplied term, the word "science" has been chosen to point out without equivocation the path that leads to truth.

The foundation of the Religion of Science is the principle that it is a sacred duty to investigate the truth with the best means at our disposal, and when it is ascertained, to regulate our conduct

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2, pp. 278–285) entitled "The Clergy's Duty of Allegiance to Dogma and the Struggle Between World-Conceptions."

*The words "Evolution of the Monad" are apparently inserted by the translator and must not be charged to Professor Harnack's account. I do not know where he has found the expression "Evolution des Einen," of which he says "and this is his chief thought"; nor do I know what is objectionable in the phrase. All depends upon the meaning of the word "*des Einen*."

accordingly. Truth is briefly a concise and exhaustive description of fact; a scientific description of facts is what is commonly called "natural law," and natural laws formulate the permanent in the transient, the everlasting in the change, the abiding in that which passes away. An investigation into the nature of natural laws shows that they must be all consistent with one another. There is but one truth, and all various truths are but so many aspects of that one truth. It has been claimed that religious truth can stand in contradiction to scientific truth, and that religious truth is superrational. He who *ex principio* uses a contradiction as the cornerstone of his world conception, builds upon sand. People who cannot gain clearness of understanding naturally resort to such ideas, but they ought to be conscious of the fact that it means a bankruptcy of both their religion and their philosophy. There is no duality in truth. All truth is sacred, all truth is divine, all truth is a religious revelation. Or, in other words, science *is* revelation.

We do not deny that the sacred canon of Christianity is a revelation; we only deny that it is the *only* revelation or the *standard* by which all other revelations must be measured. We reverse the old order of argument; we do not say "Love thine enemy" is a binding injunction because we read it in the Gospel, but we say the spirit of the Gospel is divine because and to the extent that it contains moral truths which are based upon a broad sympathy and a profound comprehension. We must learn to trust in truth, and we must have faith in truth, for faith in truth is the only true religion in the world. If God is not in truth, we had better let God go. If truth does not teach morality, then there is no morality. If truth is unreal, then the world ought not to exist and life would not be worth living.

What shall we say of an inquirer into truth who declares:

"I can make little use of this faith in the scientific investigation of nature and history."

I am grieved to say that the sentence comes from the pen of Professor Harnack. Professor Harnack, a leader among the most competent, who has so vigorously and boldly applied "his faith in the scientific investigation of history," comes and says he can make little use of it. I fear to repeat Mr. Snell's words, that it is "more

than questionable whether the Harnack of the closet is in accord with the Harnack of the rostrum," lest Professor Harnack might again misunderstand the meaning of the words. But it seems to me clear that Professor Harnack in his study follows the injunctions of the Religion of Science, but when he appears before the public he denounces it as useless.

This is no charge of hypocrisy, but of inconsistency, and I am open to conviction. Truly Professor Harnack's "sound learning is not feigned," but it is, by some inadvertence, just a little twisted. Professor Harnack is not clear concerning the philosophical basis of his religious conceptions; therefore, "the idea of a Religion of Science is to him a wholly indistinct conception." He lives up to the ethics of a religion of science in the sanctum of his study, where he moves within the boundary lines of his specialty, but as soon as he enters the sanctissimum of his heart his faith in truth fails him, and he surrenders every attempt to throw the light of science into the wondrous depths of the human soul. He says: "I know only of a religion which is mystically experienced by us." If Professor Harnack would but be consistent, he would apply right here the principle of investigation, and all the clouds of his mysticism would disappear.

It is the office of science, i. e., of clearly presented truth, to dispel mysticism; but understand me rightly: In saying this, I do not advocate the eradication of mysticism, or mean to denounce it as obscurantism. Mysticism is a very important element in the structure of the human soul; and it is the path to truth upon which religion travels—indeed, it is, so far as I can see, the only path upon which the religious evolution of mankind can take place. When comparing science with religion, we are, in consideration of the conservative attitude of our theologians, inclined to say that science is in advance of religion. This is true in many respects, but not concerning the main issues of religion. In the recognition of moral truths, religion has anticipated the results of scientific inquiry. The great religious teachers of mankind have, with a prophetic insight into the nature of things, so to say, by a religious instinct, proclaimed truths which the sages of their times were unable to resolve

or account for. Science must catch up with religion and must learn to decipher the grand utterances of Jesus of Nazareth, and to do this is the sole object of all theological scholarship and of the philosophy of religion. Many are diffident and say it cannot be done, but we say it must be done; man's rational nature impels him to do it; and it is his highest duty to understand the nature of his religious ideals.

The great facts of history are repeated in our daily experience. Who of us has not, long before his intelligence developed into full maturity, on various occasions dimly felt the correct solution of moral problems? As there is a life-preserving instinct in the world of lower animals, so there is a soul-quickening moral instinct in man which is mystically experienced. Professor Harnack seems to believe that our mystical experiences cannot or should not be subjected to scientific analysis. If this is his position, we differ from him; if not, how can he arraign the Religion of Science as profitless?

Professor Harnack may regard the Religion of Science as rationalism; and in a certain sense it is rationalism, but in another sense it is not. It all depends whether we mean by rationalism simply a free exercise of man's reason, or that historical movement which attempted in a most prosy way to rationalise the religious traditions of Christianity. On the one hand, we do not say that man can be saved by reason and by reason alone, for man must work out his salvation with diligence; he must be active and energetic, and in order to continue in his work he must have the enthusiasm of faith and a holy zeal for the cause of truth. Reason is only one side of man's being, and we are not blind to the existence and importance of other sides. But on the other hand we say, Give unto reason what is reason's; hand over to rational inquiry the whole field of your experiences, external as well as internal, and investigate the bottom facts from which develop such religious ideas as God, soul, and immortality. There is truth in all of them, and you will find that a real, thorough comprehension of your religious notions will always tend to deepen them, and will show truth in a higher significance and a nobler sublimity. For truth is greater than all mythologies.

Professor Harnack has not as yet found the unity of nature and spirit, but he believes in it; he trusts to find it "not in the Unknown, but in the living God." Very good! search for unity and you will find it—not in the Unknown,* but in the knowable realities of life. The first condition, however, of finding a unity of nature and spirit is to drop the antithesis between both, for spirit is natural; spirit is a part of nature as much as a man's thoughts are part of the man. Nature is the whole, and spirit is the crown of nature; it is nature's divinity, without which the whole creation would be a meaningless jungle.

It is not my intention to criticise Professor Harnack's confession of faith, which he calls "a living faith in the living God" (see, for instance, p. 546). But I cannot help criticising the form in which he states it. A God who is not a living God is no God, and a faith that is not a living faith, that is to say, an actual power in man's soul, is no faith. What is the use of heaping up words, which in their unnecessary iteration make the impression of contentious protestation? Professor Harnack contrasts the living God with "the philosophical or mystical abstraction" (p. 546), and calls the former "the revealed, the assured, the gracious God, apprehensible to every Christian."

Had Professor Harnack borne in mind the nature of knowledge and the methods of representing realities in thought, he would not have ventured upon these amplifications. What is his idea of man's soul but an abstract, while the object which the word soul represents is a living reality? All our notions are abstracts and the idea of God is as much an abstract as the terms matter and energy. Death will lose most of its horrors in the mind of a thinking man, especially if he is an experienced physician; is for that reason a more scientific conception of death less real than the fright of a panic-stricken crowd? The physicist's definition of force is not of a paler cast of thought than that of the farmer, and the philosopher's idea

* Professor Harnack probably regards *The Monist* as an agnostic publication. He is mistaken. Professor Harnack is probably more agnostic than *The Monist*, for his "living God," who is not the Unknown, is later on called "the mysterious Being."

of God does not grow lifeless in the degree that it becomes more exact. Professor Harnack's expressions would pass unchallenged in a prayer-meeting but are out of place in a scientific elucidation where they are not only liable to be misunderstood as orthodox asseverations, but are also actually erroneous, bringing about an antagonism between religious sentiment and the philosophical comprehension of religious ideas which does not exist. That God, who in order to be and remain alive, must not become philosophical, is doomed before the tribunal of scientific critique.

The science of nature, as a whole, and also the various branches of science, especially psychology and ethics, are of greater importance to theology than Professor Harnack is aware of. He says:

"Of what assistance can the science of nature be to me, if I wish to find out to what *persons* our present humanity is most indebted for those powers of faith and conscientiousness of love and sacrifice, of courage and industry."

He lays great stress upon the fact that the Gospel *is* Jesus Christ —a person. He says in his "History of Dogma" (Engl. tr. p. 10):

"It can be shown, that everything that is 'lofty and spiritual' in the Psalms and Prophets, and everything that had been gained through the development of Grecian ethics, is reaffirmed in the plain and simple Gospel; but it obtained its power there, because it became life and deed in a *Person*, whose greatness consists also in this, that he did not remould his earthly environment, nor encounter any subsequent rebuff,—in other words, that he did not become entangled in his times."

Setting aside the question as to the nature of Christ's greatness, we wish to say that any one who lays so much stress upon the incarnation of the Gospel in a person should first of all concentrate all his attention upon finding out what is the nature of personality. Much has been done of late in this line. I only remind the reader in this connexion of Prof. Th. Ribot's excellent memoirs on psychological problems. As soon as we understand the nature of a personality we shall overcome the mysticism that is still attached to the theological conceptions of the soul and the soul's immortality. We shall also learn to understand why God cannot be personal but must be superpersonal. Professor Harnack is at liberty to denounce the idea of a superpersonal God as atheism. We shall patiently bear the opprobrium, in the hope that he will himself by and by come

to the conclusion that the attribute of personality can only belittle God and that the belief in a personal God is after all only a higher type of paganism.

Having, in his way, characterised the Religion of Science, Professor Harnack says, "I should rejoice if I were mistaken." Very well then, there is cause enough to rejoice; and let me add, that I have always regarded Professor Harnack as one of the chief pioneers of the Religion of Science. I am sorry to see that he has not as yet freed himself from the bondage of mysticism; but since in his work he adopts the ethics of the Religion of Science, we must feel confident that his path will lead him at last into the full light of the new dispensation which is the fulfilment of all the old prophecies, the only orthodox and the only catholic religion.

EDITOR.

LEONARDO DA VINCI AS A PIONEER IN SCIENCE.

IT WERE easier for the mature intellect to recover that belief in fairy-tales which is the privilege and joy of childhood, than for any of us to return to a point of view which enlightened men have long since left behind. If our imagination be keen and our sympathy quick, we can perhaps understand what it was that our forerunners believed, but we shall never feel towards it as they felt. There are no dryads in the woods, no naiads in the streams, for us; the rudely hewn block of wood is no fetish to which we bow; the story of griffin or vampire does not affright; the naïve mediæval miracle wrought by some pious relic has no power to confirm our faith: in these things we detect at the most an allegory or a hallucination. The race makes certain advances, as a traveller journeys through a strange country by night, without being able to map out its course. Not only are the gates of birth and death wrapped in the mists of lethe, but so too are the thresholds of progress. Only in the realm of reason, and of morals derived from reason, do all men walk as equals and contemporaries. The mirage of fancy, the fog of superstition, vanish as the sun of reason prevails; once men regarded them as permanent realities; now we know that they were evanescent; herein lies the difference between us and our ancestors,—a difference absolute and unalterable.

As we are more learned so are we more sophisticated than our fathers. We hesitate to say of any truth "This is final," because finality implies a world bound in adamantine unchangeableness, whereas we perceive that ours is a fluent and unfolding world. This perception, which is coming to be the common property of cultivated

men, even of those who strive most earnestly against it, distinguishes the Modern from the Middle Age. To us, all things are in process of development; to the mediæval, all things—religion, science, government—were fixed. The earth itself was to him the centre of the universe, a fixed point round which the planets, sun, and stars revolved; his religion, formulated long before according to supernatural dictation, might be neither amended, nor put in question. Philosophy was not the exploration of the infinite by finite man, but the exercise of his mind along a clearly defined path which always curved back to the starting-point. Science was a mixture of half-truths and absurdities: the dictum of Aristotle, Ptolemy, or Galen being accepted as infallible, even when plainly contradicted by the experience of every day. Government, in theory at least, was a rigid scheme foreordained from the beginning.

I am not concerned to point out what benefit the race derived from that age of formulas; benefits there were, if only in the knowledge gained that the soul cannot prosper in bondage; my purpose is to call fresh attention to the contrast between that age and our own, in order that we may measure the magnitude of the achievement of such men as Leonardo da Vinci who broke away from mediævalism, and who, though surrounded by conditions utterly unlike ours, nevertheless belongs in spirit to our time rather than to his own. That spirit was the spirit of inquiry, the modern spirit; the mediæval did not inquire, he took for granted. Not only in all those considerations which haunt serious minds—the nature of God, immortality, conscience—did he accept without demur the statements handed down to him, but also in purely physical affairs was he uncritical. Read the manual of the medical school of Salerno, and see how hearsay and superstition took the place of observation in the treatment of the simplest form of disease. Read Brunetto Latini's "Natural History" and see what fantasies were spread concerning the animal kingdom. One example will illustrate the general attitude of mediævals towards demonstrating facts: There was an old fable that salamanders can live in the hottest flame. A modern would have put a salamander in the fire and watched the effect; the mediæval, on the contrary, never thought of applying so simple a

test,—he believed the fable, and gravely repeated it. His habitual attitude was one of credulity.

We need not wonder at this. Inquiry presupposes ignorance, a worthy desire to clear away doubts. We do not dispute over the multiplication-table. But to the mediæval the ultimate mysteries of human destiny were wholly removed from the pale of inquiry; he might not understand the strange scheme of the incarnation, of vicarious atonement, of the resurrection, but he believed it, and believing, he ceased to inquire. He did not doubt the reality of heaven or of purgatory: he was more certain of the existence of hell than of the countries beyond his native mountains. This certainty could not but discourage investigation into the primal mysteries.

Moreover, his creed tended to make him despise the material world in which he lived. The Christianity which he professed was a composite of Hebrew, Persian, and pagan beliefs, which had been fitted together at different times. That they were mutually contradictory did not trouble him, because he gave a proof of his faith when he believed impossible doctrines; that they conflicted with the simple, authentic teaching of Christ did not trouble him, because that teaching came to him after councils, doctors, and a hundred popes had stamped their several interpretations upon it. Among the strange doctrines which had wound itself round early Christianity was the Manichæan doctrine that matter is the product of an evil principle, a Devil, who wars perpetually against God, the creator of spirit. This being accepted as true, the part of the devout mediæval was plain: he strove to eschew the material world as the Devil's kingdom. This world included, of course, his own body, which he mortified to the glory of God and the discomfiture of Satan. To have allowed his attention to wander to the processes of nature and to have examined into their causes would have been unholy and perilous: unholy, because in so doing he would have given to the works of God's adversary interest which he ought to consecrate to God alone; perilous, because the Devil had cunningly sown the world of matter with lures to ensnare the souls of men. And after all what could it profit him to learn all possible knowledge concerning the material world? In God's world, in heaven, which

he hoped to enter after a brief exile here below, such knowledge would be irrelevant, useless, impious. His body, therefore, was not merely an inert clog to salvation, it was the active ally of the Fiend, who spread before every one of the bodily senses attractions to entice the soul away from the contemplation of God. Pleasure became synonymous with sin; beauty was the mask of temptation. Only by a strenuous asceticism, a mortification of the senses, and a starving of all mundane desires, could the mediæval devotee cheat the Devil. No wonder that he walked on tiptoe, as over young ice, when one misstep would plunge him into the abyss forever! No wonder that he gave the least possible heed to the properties of laws of matter!

But in the thirteenth century Christendom began to awake, began to suspect that it had been the victim of a hideous nightmare. Dante, the first modern man, embodying the theology of the Middle Age and foreshadowing the realism of the new age, made an allegory of the actual moral condition of men on earth. The epic poets of antiquity had sung the adventures of gods and heroes; Dante wove an epic out of the experiences of the human soul on its passage from the depths of imperfection to the heights of righteousness. Hitherto, an unbridgeable chasm had yawned between pagan and Christian times; Dante, feeling profoundly the continuity of the life of the race, introduced into his vision the chief personages of pagan history and mythology, together with the saints and heroes of Christianity, and his own contemporaries, in order to complete his portrayal of human character. This was a long step gained; it was an admission that whatever might be the destiny of men in the world to come, they could all, whether born before or after the birth of Christ, be measured by the same moral scale in this world.

Close upon Dante followed Petrarch, Boccaccio, and the swarm of Humanists. Learning ceased to be the exclusive privilege of ecclesiastics. The conviction deepened that man's life on earth is most interesting for its own sake, irrespective of its being, or not being, the preparation for eternal life hereafter. Across a thousand years the civilisation of Greece and Rome loomed up in fascinating grandeur. Over the barrenness of ages the fresh vital air of Athens blew straight upon Italy, as a pollen-bearing wind in spring-time;

and the Humanists breathed its freedom and joyousness as eagerly as a bedridden patient would welcome health, or an old man his vanished youth. How futile now seemed the quibbles of the schoolmen! How mistaken the crabbed precepts of mediæval theologians! How repulsive, narrow, and unnatural the life that they had led! The Greeks, the Romans, with no Christian teaching to guide them, with no ascetic fanaticism, had lifted their commonwealth to a plane of grandeur far above that of any subsequent State; and in virtues, civic or private, in poetry, in commerce, in the arts, they had surpassed their Christian successors. To recover all that could be recovered of that classic civilisation, its ideals and achievements, became therefore the passion of the Humanists; they searched each ancient manuscript as if it were a lost will in which they might find that some forgotten ancestor had bequeathed to them an incalculable fortune. That must ever be regarded as one of the noblest epochs in the history of the race when the best men joined the pursuit of things spiritual and intellectual with all the fervor and pertinacity with which their descendants a century later set out in quest of Eldorados in America and to conquer the material wealth of the Indies. The immediate result of this enthusiasm was to bring to the Humanists a sufficient knowledge of the ancient civilisation to enable them to compare this with the mediæval Christian standard which had hitherto reigned alone. From this comparison sprang criticism, the handmaid of truth.

Little enough did the early explorers suspect whither their quest would lead them. They could not guess that a search for classic manuscripts would end, as Michelet has it, in the discovery of man and of the world. Yet so it was. The spirit of inquiry, roused from its millennial torpor, hungrily investigated all things. The old answer to the riddle of existence was cast aside as unsatisfactory; a new answer must be wrested from the dumb, inscrutable universe. In their first passion for discovery, men did not dream that the solution might elude them. Wherever they looked they saw untrodden avenues leading into the heart of the mystery. Discarding mediæval preconceptions, they began to study human nature. They looked upon the earth and saw that it was fair, and its

beauty no longer seemed to them a Satanic lure. They began to see in the world of matter orderly processes, the coursing to and fro of vivifying laws, like blood in the arteries of man. They looked upon the heavens, and their souls were awed by a premonition of vastness only consonant with the belief that God, and not the Devil, was their author. In the presence of the sublime immensity of the stellar spaces, the cramped view of human destiny as expressed by mediæval dogma, must seem impious and absurd. By the close of the fifteenth century men were beginning to rise to the conception of a cosmos, of a world forever *becoming*, alive and interrelated in all its parts. The old notion of fixity,—of one unchanging religion, of one foreordained and immutable ideal of government, of earth anchored in space, and of man the crown and centre of creation,—was doomed. The discovery that this is a living and unfolding universe was the most important event in human history since the birth of Christ.

I would not paint the achievements of the Renaissance in colors too gorgeous, nor imply that the men of that epoch understood the bearing of the movement they originated. Many of the deductions drawn from their tentative investigations have been drawn very recently. Many of the paths they opened and explored diverged into the wilderness where the footsteps of man flounder perilously and the soul of man finds no cheer. I have elsewhere stated* some of the deficiencies, the appalling, cardinal deficiencies, which, in Italy, at least, caused the Renaissance to be partial and temporary. But after deducting from it what we must, it remains a period of inestimable significance. If its very doubts were pregnant, how shall we define the truths it revealed, truths typified by the discoveries of Columbus and Copernicus, and by the invention of Gutenberg? The mission of the Renaissance was to establish reason as the final guide and judge of mankind. With the enthronement of reason, the German Reformation, the American commonwealth, the French Revolution, and every other advance which the race has made, became intelligible.

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*See *The Dawn of Italian Independence*, Vol. I, Chap. 6.

To *rationalise* nature, to discover, that is, reason in her manifold operations, to substitute for the mediæval scheme of ignorance and miracle the idea of cosmic order, has been the particular business of science for more than four centuries. We who inherit the knowledge accumulated by the patience of countless investigators and co-ordinated and classified by a few master thinkers, cannot put ourselves back into that state of mind in which the earliest explorers set out. Immemorial traditions, habits of thought, lack of instruments, theological prejudice, were all against them. Nature lay under a ban. The world was an inert mass. To overcome these obstacles required the development of other organs, the implanting of the spirit of inquiry. The wisest men had hitherto been as babes in the presence of the majestic forces of the material universe. The laws of gravitation, of expansion, of heat and cold, worked in and through them, yet they heeded them not. Electricity sped on its errands from zenith to nadir, invisible, swift as an archangel, yet were they unaware of its passing. They were blind to nature's beauty and power, deaf to her innumerable voices. In what mysterious manner a few men began to see and hear, let those explain who know how the acorn enfolds the far-spreading oak in its shell, and how in an embryo lie dormant the intellect and soul of a possible Cæsar or Shakespeare.

What we do know, however, is that in the fifteenth century a few men began to scrutinise nature, very tentatively at first, and with no premonition of the results which such scrutiny would reach. Foremost among them was Leonardo da Vinci. Other investigators of that century, Copernicus the most conspicuous, have ranked higher than he in the annals of science; but none, as I hope to show, equalled him in scientific endowment. He was disenthralled from mediæval preconceptions, for he possessed a temperament so purged of theories that in approaching a new fact his sole aim was to discover the true nature of that fact, unbiassed by what others had found in it. His curiosity was insatiable; his methods were observation and experiment; his advance was from the known to the unknown, whereas the mediæval, as we have seen, took the unknown for granted, and ceased to inquire. That Leonardo's achievements

in science and invention should never have had due recognition, is to be attributed in part to their great range—the world remembers longer him who travels farthest in a single direction, than him who travels far in many; and in part to an accident which buried them for three centuries. Even now we have but an imperfect record of them. Not as a candidate for belated fame—Leonardo's fame is secure—but as a pioneer of the modern spirit, and as a favorite whom Nature took into her confidence, let us consider him here.

The important facts in Leonardo da Vinci's life can be briefly told. The natural son of a Florentine notary, he was born at the castle of Vinci, on the Arno, between Florence and Pisa, in 1452. Vasari relates stories of his youthful precocity, which often astonished his instructors, and of his fondness for music. Being admitted early into the studio of Verrocchio, he learned not only painting and sculpture, but also the goldsmith's art, which, we may remark, had an influence not easily to be computed in giving to the Florentine School of Painting that precision, that loyalty to the line, which distinguish it from the Venetian School. How the young Leonardo painted into one of his master's pictures an angel far beyond Verrocchio's skill, and how he drew a Gorgon's head so life-like that it frightened persons who came upon it unawares, need not here be repeated. In 1472 he was already an independent artist, and during the next eight or nine years he worked in Florence, but to what purpose we can only guess, as almost all the fruits of this period have been lost. In 1480 he addressed a remarkable letter to Lodovico Sforza, tyrant of Milan, asking for employment and laying chief stress on his ability as a military engineer. The letter brought him an invitation to go to Milan, where he was engaged in mechanical and engineering enterprises, in the direction of ducal festivities, and in the construction of a colossal monument to Francesco Sforza, Lodovico's father. The fresco, "The Last Supper," is one of the few remaining authentic works of Leonardo's brush during his long residence in Lombardy, and no one now can say that a single patch of color in that ruined masterpiece was laid on by him. Indeed, fate, which showered upon Leonardo innumerable gifts, seems to have decreed that posterity should know his genius by hearsay only, so per-

versely has fate allowed his works to be lost or mutilated. That colossal statue of Sforza was not yet completed when Louis XII. invaded the Milanese and put an end to the sculptor's work there; the great fresco has suffered irreparably from neglect, violence, and restoration; and of the half-score paintings which remain scarcely one gives us a hint of the beauty of its original coloring.

In 1500 Leonardo visited Venice and Florence. Two years later he was appointed engineer by Cæsar Borgia, who was engaged in a military expedition against those States south of the Po that had not already submitted to his tyranny. During this summer we have glimpses of Leonardo at Urbino, Pesaro, Rimini, Cesena, and Cesenatico, along the Adriatic; at Siena, Chiusi, and Orvieto in the Centre; and at Piombino near the Tuscan Sea. In the following spring he settled at Florence and painted "The Battle of Anghiari" on one wall of the council hall of the Palace of the Signory, while on another wall his young rival, Michael Angelo, painted a vast group of "Soldiers Bathing." Not a trace of either fresco survives. But Leonardo, never at his ease in Florence, returned to Milan in 1506. Thenceforward, until 1515, he seldom stayed long in any place; till Francis I. came into Italy and induced him to go back to France, where he was assigned a residence at the Château Cloux, near Amboise on the Loire, 1516. There he died May 2, 1519, and was buried in the Royal Chapel at Amboise.

In person, as in mind, Leonardo lacked no gifts. He excelled in dancing, in fencing, in horsemanship, in lute-playing. Well-known anecdotes, chiefly drawn from Vasari's precious and inexhaustible quarry, illustrate alike his unusual physical strength and his wonderful dexterity. He was genial in temper and kind in heart, and he possessed the rare combination of humor and wit. His interest in man and in nature was many-sided and unflagging; nothing being too vast or too minute for his attentive curiosity. He had the patient inquisitiveness of the specialist who pores over details; he had also the generalising faculty of the philosopher who deduces laws and discovers wider relations. His attitude towards life was, in a word, thoroughly modern and scientific. As little as possible did the past, with its traditions and dogmas, hamper him: to search

out all things, to experiment and verify, to let his own eyes test and reason be the judge—this was Leonardo's method.

That letter which Leonardo wrote to Lodovico Sforza is still extant, and it throws so much light upon his genius and his self-knowledge that it is worth quoting almost entire:—

"Having, most illustrious lord, seen and considered the experiments of all those who repute themselves masters and inventors of warlike instruments, and having observed that their said instruments are nowise different from those in common use, I will attempt, without disparaging any one else, to explain myself to your Excellency; opening for this purpose my secrets. . . .

"1. I have a way of making bridges, very light and adapted to be carried very easily, by which to pursue or escape from an enemy; and others more secure, and indestructible by fire and battle, easy and convenient to set in position and to remove. And means for burning and destroying those of the enemy.

"2. In investing a place, I know how to remove water from fosses, and to make various scaling-ladders, and other instruments pertinent to such an expedition.

"3. *Item*, if, on account of the bank or strength of place and site, in the siege of a city cannon cannot be used, I have means of undermining every fortress, provided it be not founded on stone.

"4. I can make cannon easy and convenient to transport, by which burning stuff can be discharged, whose smoke will cause great fear to the enemy, to his serious harm and confusion.

"5. *Item*, I can make mines and narrow and winding ways to reach without noise a given [point]; and, if need be, I can make them pass under trenches or a river.

"6. *Item*, I can make covered carts, secure and indestructible, which, with their artillery, entering among the enemy, will break the strongest body of men; and behind these carts infantry can follow unwounded and without any hindrance.

"7. *Item*, if necessary, I will make cannon, mortars, and fire-arms of most useful and beautiful forms, different from those in common use.

"8. When cannon are impracticable, I will devise catapults, mangonels, mortars (*trabuchi*), and other instruments of wonderful efficacy and novelty; and, in short, according to the variety of needs, I will invent divers and many engines of offence

"9. And if by sea, I have a lot of instruments most suitable for attack and defence; and vessels that will resist the fire of the heaviest cannon; and powders and fire-stuffs.

"10. In time of peace, I believe I can give good satisfaction—in comparison with any other—in architecture, in constructing edifices, both public and private, and in conducting water from one place to another.

"*Item*, I can do in sculpture of marble, bronze, or clay, likewise in painting,

equally as well as any other, be he who he may. Further, the work might be executed on the bronze horse, which will be the immortal glory and eternal honor of the happy memory of your father, and of the illustrious House of Sforza. And if to anybody any of the above-mentioned things seem impossible and unachievable, I offer myself most ready to make trial of them in your park, or in whatever place shall please your Excellency, to whom in all humility I commend myself."

In this letter, written when he was only twenty-seven or twenty-eight, Leonardo magnifies his ability as an engineer and speaks but briefly of his skill as an artist—briefly, but haughtily, as that phrase "equally as well as any other, be he who he may," bears witness. In a little man such an inventory of talents would sound presumptuous, but Leonardo can do all that he announces. He is seeking employment from a military tyrant who needs engines for conquering his foes more than he needs paintings or statues; and therefore Leonardo insists on his own pre-eminence as an engineer. But there shall be frescoes, too, and monuments, and rare products of the arts of peace, if only Louis "the Moor" will listen to him.

Let us now survey the circle of his achievements.

Leonardo flourished in a period of transition when mediæval weapons were being replaced by modern fire-arms. The tremendous military value of gunpowder, after its discovery by Roger Bacon in the middle of the thirteenth century, had not quickly been perceived. Cannon were used, it is true, at the battle of Crécy, in 1346; but their general adoption can hardly be dated earlier than the last quarter of the fifteenth century, when they were used by the Spaniards in the conquest of Granada, by Louis XI. in his wars with the great French feudatories, and by the Italian mercenaries in their sordid, dilatory campaigns. So among Leonardo's inventions we find some which were improvements on the pikes, cross-bows, and catapults of the earlier system, and others which, adapted to the use of gunpowder, extended the scope of the new system. He designed a huge machine, to be worked by ten men in treadmill fashion, from which a large and almost simultaneous volley of shafts could be discharged—a forerunner of the Gatling gun and the *mitrailleuse*. He also planned great catapults, and an enormous copper cannon, which he called *Architonitros*, to be exploded by steam. He

ascertained that cannon-balls have a velocity of one hundred and ten metres per second, and that it is useless to increase the charge of powder, unless the size of the grain be increased. He experimented with fusees; he devised methods for strengthening fortifications by artillery, and for making ravelins, mines, and storming-machines. Just how far he advanced the art of fortification cannot be determined, for we cannot tell how much Vauban invented himself, and how much he borrowed from the Italian military engineers who preceded him, among whom Leonardo stands foremost. The very important principle of clearance fire, often credited to the Frenchman, appears to have been understood by his Florentine predecessor. Certainly, Leonardo made drawings of what are apparently breech-loading guns. He computed the relative speed and efficacy of stone and lead balls, and suggested that they be conical instead of round. In marine warfare and in navigation he designed improvements. He mentions the log for showing a ship's progress at sea; hitherto, the earliest reference to the log was made by Magellan in 1521. He invented swimming-belts, and, more important still, paddle-wheels by which boats might be propelled against wind or current.

A century before Stevinus, Leonardo pointed out the need of a rational treatment of mechanical problems; possibly he suspected the uniformity of mechanical laws. He found the centre of gravity of a pyramid; he explained the theory of the inclined plane; he studied the phenomena of concussion, of friction, of the resistance of springs. He invented a dynamometer. Some of his axioms deserve to be cited, for comparison with those now held to be true: "Percussion," he says, "is power reduced into a little time," and "exceeds, in equal time, every other natural force"; "An object which falls freely, acquires in every degree of its descent degrees of velocity;" "A man walking goes faster with his head than with his feet;" "That body will become lighter which occupies more air;" "No dead object moves by itself, but by another is its motion caused;" "No moving object will ever move faster than the force which moves it;" "Every action is the result of motion." In his experiments he used elastic balls suspended by threads, a device

adopted by Borelli and later physicists. He was aware that a body can be under the influence of more than one motive force at the same time. In his researches in attrition and friction he anticipated L'Amoutons (1699), Bülfinger (1727), and Desaguliers (1832).

Although his notes on this subject are scanty we infer that he gave attention to electricity. According to Libri,* he first remarked the regular movement of dust placed on elastic surfaces in vibration. Like the inventors of our own times, he aimed at substituting a machine for a man, wherever this substitution would save labor. That he was the first to employ the *plus* and *minus* symbols, is an assertion I am unable to verify.†

Coming next to botany we find that Leonardo's priority in several important discoveries has been recently established. G. Uzielli‡ traces the advance he made in three directions, as follows:

First, Leonardo discovered the laws of phyllotaxis, or the arrangement of leaves on their stem. He was the first to observe that the order of growth in plants and trees of the same species is uniform, and that their leaves have three different modes of distribution: they may be placed opposite to each other; they may be whorled, or verticillate; they may be alternate, or spiral. He demonstrated that when leaves grow in pairs they have generally a decussate arrangement, that is, each pair is at right angles to the pair directly above or below it; and he also showed that when leaves are verticillate, those in one whorl are seldom in a direct line with the whorls above and below. He noted that the *quincuncial* form is common in the spiral arrangement, the cycle being completed by five leaves, and the sixth leaf being in a direct line with the corresponding leaf above and beneath. "Since branches grow from buds generated in the axils of leaves," he said, "the arrangement of branches on the trunk necessarily corresponds to that of the leaves on the stem." To Sir Thomas Browne, whose book, "The Garden

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* Libri: *Histoire des Sciences Mathématiques en Italie.* Paris, 1840.

† Richter, in his work on Leonardo da Vinci (London, 1880), regards this as not proved.

‡ *Il Nuovo Giornale Botanico Italiano*, Vol. I, No. 1, 1869; quoted in *Nature*, Vol. II, p. 42.

Cyrus, or the Quincuncial Lozenge," was printed in 1658, the merit of this observation has been hitherto attributed.

Second, Leonardo discovered that the age of exogenous trees can be determined from the structure of their trunks. He writes: "The southern part of the plant shows more vigor and youth than the northern. The rings of the branches of trees show how many years they have lived, and their greater or smaller size whether they were damper or drier. They also show the direction in which they were turned, because they are larger on the north side than on the south, and for this reason the centre of the tree is nearer the bark on the south than on the north side." Malpighi and Grew (whose works appeared in 1675 and 1682 respectively) have heretofore enjoyed the honor of this discovery. But Montaigne mentions (in his "Journey into Italy," July 8, 1581) that at Pisa he bought several curiosities, and that "the person of whom I bought these things, a man of great note as a mathematical instrument maker, told me that trees have all within them as many rings and circles as they number years. He showed me examples of this in every kind of wood in his shop, for he is a turner by trade. Those trees in a forest which look northwards have these rings closer and thicker than the trees which stand in other directions; and this person told me that this was so invariably the case that by looking at a piece of timber, he could tell how old the tree was, whence it came, and in what direction it had stood." Montaigne's "Journal" was recovered only towards the end of the eighteenth century, so that Malpighi and Grew could not have borrowed from it, but it seems probable that the facts he mentions as having been disclosed to him by the Pisan turner, may have been generally known in the seventeenth century.

Third, Leonardo investigated the process of growth in exogenous stems by the formation of new wood on the bark, a process he describes thus: "The growth in the size of plants is produced by the sap, which is generated in the month of April between the outside coating (*camisia*) and the wood of the tree. At the same time this outside coating becomes converted into bark, and the bark acquires new crevices of the depth of ordinary crevices." This explanation is, I believe, no longer accepted by botanists; but, though

Leonardo's conclusion was inaccurate, his researches must have contributed to the discovery of the truth. He made many drawings of leaves, which for exactness and beauty have never been surpassed.* He also pursued other, more fanciful, experiments, as, for instance, one for testing the effects of poison on trees, by boring a hole in the trunk and injecting arsenic, or sublimate, in alcohol. And he described how an impression of leaves may be had by smearing them with white lead, oil, and lamp-black—as ink is spread on the types—and stamping them on paper: a process which, somewhat modified, has recently been used with success by Hauer and others.

That he was a close observer of outward nature, his paintings and drawings of landscape abundantly testify; but he went deeper than the surface, and foresaw more than one vital fact which geologists have since established. Fossils, he maintained, are the remains of plants and animals of a bygone age, and not, as was commonly asserted by his contemporaries, mere "freaks of nature." When fossil shells were still in the sea, he affirmed, river-mud near the coast had penetrated into them. "They tell us that these shells were formed in the hills by the influence of the stars; *but I ask, where in the hills are the stars now forming shells of distinct ages and species?* and how can the stars explain the origin of gravel, occurring at different heights and composed of pebbles rounded as if by the motion of running water; or in what manner can such a cause account for the petrifaction in the same place of various leaves, seaweeds, and marine crabs?"† In thus proclaiming the continuity of geological causes, Leonardo proves his kinship with the masters of modern science. He attributed the denudation of mountain-peaks to the gradual subsidence of water, and saw that the direction of a falling body must be affected by the rotation of the earth—an obser-

* "I might refer in detail to four studies of bramble branches, leaves, and flowers, and fruit, in the Royal Collection at Windsor, most wonderful for patient accuracy and delicate execution; also to drawings of oak-leaves, wild guelder-roses, broom, columbine, asphodel, bull-rush, and wood-spurge in the same collection. These careful studies are as valuable for the botanist as for the artist. To render the specific character of each plant with greater precision would be impossible." J. A. Symonds, *The Renaissance in Italy: The Fine Arts*, p. 320.

† Quoted by Lyell, *Principles of Geology*, p. 19 (edit. 1862).

vation which probably explains the following memorandum: "Write to Bartholomew the Turk about the ebb and flow of the Pontic Sea, and to find out whether a similar phenomenon exits in the Hyrcan, or Caspian Sea." He held that valleys are the beds of former rivers.

His observations of the moon are even more interesting. He it was who, long before Kepler and Galileo, demonstrated that the faint light which we see on the new moon is reflected from the earth.* Kepler, in 1596, and Galileo, a few years previous, published their explanation of this phenomenon. Leonardo believed that the solar light is radiated to the moon from those parts of the earth where there is most water: "The water which clothes a large portion of the earth receives on its surface the image of the sun, and with this shines upon the universe and becomes a star with the same splendor which makes us see the other stars." He also stated that "the moon has each month a winter and a summer, and has greater heat and cold, and her equinoxes are colder than ours." To a lunar inhabitant, he said, the earth performs an office like that which the moon performs for us by night. Although the Ptolemaic system still commonly obtained—the terrestrial explorations of Columbus, and the celestial explorations of Copernicus having as yet aroused the suspicion in only a few alert minds that Ptolemy's doctrine rested on a fallacy—Leonardo maintained that the earth is round, and showed that at a distance of fourteen miles at sea, a man's body is hidden, owing to the earth's curving surface; the distance is incorrect, but the fact of sphericity has long been undisputed. Still more daring appears his assertion that "the earth is not situated in the middle of the sun's orbit, still less at the centre of the universe," when we remember that the Church persecuted more than one man of science for hazarding this assertion, and that even to-day, the majority of otherwise intelligent persons, are unwilling to relinquish the flattering tradition which ascribes pre-eminent importance to our planet, and to ourselves as its inhabitants.

Several maps designed by Leonardo, and preserved in his "Co-

* Humboldt, *Cosmos*, IV, 483.

dice Atlantico," illustrate his geographical range: to them we may add topographical plans of many parts of Italy where he was engaged in engineering. During his life-time he was best known as an engineer—always excepting his renown as an artist—and as an engineer his name is still familiar to many who have no definite notion of the versatility of his genius. All travellers have seen specimens at Milan of his mechanical drawings, and have been told that the canal system perfected by him still supplies Lombardy with water. The Martesana canal had already been partly excavated when he took charge of it; but he invented the locks which are still in use, and which superseded the clumsier Saracenic gates previously employed. He proposed a method for draining the marshes of Piombino; he drew a plan for changing the course of the Arno by means of a canal, which has subsequently been carried out; he made sketches, when in France, for the so-called Romorontin canal; he devised a big auger for boring artesian wells; he proposed to fertilise the sterile plains of Prato and Pistoja by collecting vegetable slime or muck in reservoirs, and applying it to the soil. When but yet a youth, he offered to raise the Baptistery at Florence, in order that its foundations might be strengthened and heightened: his project, then laughed at as well-nigh crazy, has been commonly adopted in our American cities during the past twenty years, and the raising or removing of huge buildings no longer excites our wonder. He understood also the art of tunnelling. Among his drawings we find a device "by which a stream not navigable, either by reason of too little depth, or from liability to failure in time of drought, may be made useful, by dividing it into sections by diagonal dams provided at the small angle with locks." Derricks, furnished with automatic dumping-hods, like those now used, for excavating canals, are drawn and described by him, as well as a machine for raising water from a stream to the top of a tower by means of Archimedean screws.

"Mechanics," said Leonardo, "is the paradise of mathematical sciences." He invented more than thirty kinds of mills. He made files by machinery, and made machines for sawing marble, for spinning, for shearing the nap of cloth, for planing iron, for making vises, saws, and planes, and for erecting marble columns—according

to a principle recently followed in setting up Cleopatra's Needle on the Thames Embankment. Suction and force-pumps, water-wheels, and hydraulic presses were also constructed by him. He experimented in the distillation of oils and poisonous vapors to be used in warfare. In some of his sketches boats furnished with paddle-wheels are seen; in others, we find a diver's apparatus, with glass eyes and a tube for air, but no air-pump. Among his other inventions may be mentioned a proportional compass, similar to that invented by Burgi in 1603, and still known to engineers; a surgical probe, having longitudinal sections, and a screw for expanding the mouth of the wound; a gold-beater's hammer; a machine for tilling the earth by the wind's agency; cranes, windlasses, and plummets. But the most important of all, if we judge by the labor it has saved and by its universal adoption in Europe and America, is the wheelbarrow, which the French long attributed to Pascal. It would be tedious to ennumerate all the suggestions and contrivances which have already been discovered from Leonardo's only partially edited manuscripts, but a few more must be recorded, in order to show that his incessant ingenuity busied itself not less with the smallest than with the largest inventions. Among devices directly applicable to the commonplace needs of life are an automatic turn-spit, or roasting-jack; a door-latch; a three-legged stool for artists; a color-grinder, and a hood for chimneys.

In the fifteenth century even the best-informed men had but the meagrest knowledge of hydrostatics, a science to which Leonardo devoted himself, and of which he deduced many of the principles from his personal observations. "The gravity of liquids," he wrote, "is twofold: that, namely by which the whole mass tends towards the centre of the elements, and that which, tending towards the centre of the mass, creates the sphericity of water: but of this latter quality I see no method by human intellect to give a clear explanation, other than by saying that, even as the loadstone attracts the iron, so this virtue is a hidden property, of which infinite numbers exist in nature." He studied the evaporation of water at different altitudes; he studied also the motion of eddies. He anticipated Newton in explaining the motion of waves, which he compared to

that of wind in a cornfield; as the corn bends, but does not leave its place, so waves pass over the surface, but the water remains. He threw into the water a straw tied to a stone, by which it was quickly seen how the straw rose and fell. He pointed out that waves recede in a circle from the centre of agitation. Perceiving that drops of water are mutually attracted and coalesce into larger drops, he argued that rain-drops are largest when they reach the ground. His numerous experiments with siphons taught him, among other things, the specific gravity of liquids; and having observed that cotton absorbs moisture, he constructed a balance with cotton on one side and wax on the other, in order to know when stormy weather threatened: this was the first hygrometer.

From the study of the exterior of the human body, Leonardo was naturally led to the study of its anatomy; and in this he soon advanced beyond the scanty knowledge of his time, and explored new regions so thoroughly that subsequent investigators have been able but to confirm his discoveries. Anatomy was then a budding science. The little which European physicians knew about it during the Middle Age, they derived from the Arabs; but these were forbidden by their religion to dissect bodies, so that a true understanding of anatomical laws could not be reached. About the beginning of the fourteenth century Mondino de' Luzzi (died in 1326) dissected three bodies; but he and his immediate followers, Zerbi, Achilli, Sylvius, Massa, and others, sought merely to confirm the dogmas of Galen, and not to establish truth by an unprejudiced reference to nature; so that when their experiments failed to confirm Galen, they set it aside as fallacious and worthless. But when the authority of the Greek physician began to wane, the first principles of modern anatomy were arrived at. Foremost among the pioneers was Leonardo, who deserves the title of founder of the science of comparative anatomy. According to Vasari, he studied with Marcantonio della Torre, the director of an anatomical school at Pavia. He made the famous division of animals into two classes —those which have their skeleton inside, and those which have it outside. He scrutinised minutely the movements of living bodies, and distinguished the voluntary from the involuntary muscles, watch-

ing the action of the former in lifting, drawing, pushing, swinging, throwing, and other acts. He advised his pupils, if they would observe the natural working of the involuntary muscles, to go among the common people, whose emotions—whether of joy or pain, of anger or hate—paint themselves clearly on the features and are not hidden behind a mask of propriety or restraint. He used to invite peasants to dine with him, in order that he might study their expression, and, according to a well-known anecdote, he sometimes followed for many hours a stranger whom he casually met in the streets, and whose countenance interested him. Leonardo's notebooks abound in caricatures, which it would be impossible to match; they show how quick he was to detect the humorous and the monstrous hints in human lineaments, and how adept he was in giving them that prominence which is the basis of caricature. While working on the statue of Sforza, he studied the anatomy of the horse, and in his experiments for flying-machines he dissected birds in order to discover the secret of flight. In 1538, Vesale published a work on anatomy illustrated by many drawings which resemble closely those found at Kensington in the eighteenth century; for a long time Titian was supposed to be the author of the drawings in Vesale's book, but they are now attributed to Leonardo, and prove beyond dispute the breadth, profundity, and accuracy of his anatomical knowledge.* Knox declares that from Leonardo's design of the half-moon shaped traps of the aorta he must have understood their functions and thus antedated Harvey by a century in tracing the circulation of the blood. Hunter says: "I hold Leonardo as the best anatomist and physiologist of his time; he and his pupils first knew how to awake the spirit of anatomical studies." The following passage, in which Leonardo describes his method of procedure, is interesting enough to be quoted: "I wish to demonstrate the difference among a man, a horse, and other animals. I begin with the bones, and let follow next all those muscles which are joined without tendons to two bones; then those which at each end or at one end are provided with a tendon. I place the anatomy of

* The Kensington collection comprises 235 folios and 779 drawings.

the bones as far as the hip for this purpose and show the different muscle-layers, veins, arteries, nerves, tendons, and bones; afterwards, however, one must saw through them, in order to learn their thickness."

From painting and anatomy to the investigation of the structure of the eye and to optics was a natural step. Optics and perspective were interchangeable terms in Leonardo's time, and we know that he intended to publish a separate treatise on this subject. Some of the results of his experiments are included in his "Treatise on Painting," but by far the greater part are scattered among those thick note-books of his, from which an encyclopædia might almost be compiled. He preceded Cardanus (1530) and Della Porta (1558) in the discovery of the *camera oscura*, and Kircher and others in that of the megascope. "Perspective," he said, "is the rudder of painting," and he laid down the rule for getting correct images of bodies seen in perspective by outlining them upon an intervening glass plate, whereby he anticipated Albert Dürer. From his knowledge of the laws of vision he formulated the axiom that "a painting can never be as clear as a natural scene, for in nature we behold everything with two eyes, each of which gets a little different view from that of its mate"—a fact which may be recommended to those painters who believe that the aim of art is to reproduce nature with servile and finical minuteness. To Leonardo has also been attributed the invention of the stereoscope—he was familiar, at least, with its principles—and of the telescope. He knew that a crystalline lens produces ocular images. "I assert," he wrote, "that the crystalline sphere is sufficient to convey appearances [or images] to be received into man's mind; but for this purpose a dark place is necessary"—that is, a *camera oscura*. He showed how rays of light enter the eye upside down, and he noted that the pupil of the eye dilates in the dark and contracts in the light, and that nocturnal animals are peculiarly sensitive in this respect. He was mistaken in supposing that the scintillation of the stars is due to our eyelashes and lids, but he was correct in stating that "images are retained in the eye for a length of time proportionate to the luminosity of the body by which they are caused." He mentioned that effect

of radiation by which dark bodies on a light ground, and light bodies on a dark ground, appear respectively larger and smaller. Libri claims that Leonardo discovered the law of diffraction, but Black gives the credit of this discovery to Grimaldi (1665). It is not disputed, however, that Leonardo preceded Francesco Maurolico in observing that light, in passing through a hole, assumes the form of the object from which it is radiated, and not that of the hole. Moreover, he suggested the means (first applied by Bouguer in 1729) of measuring the intensity of light, stating the problem thus: "Given two opposite shadows produced upon a single object between two lights of double power, these lights being of equal density; to discover what is the proportion of distances between the lights and the object." We have his designs for convex, concave, spherical, and parabolic mirrors, and it is supposed that he employed concave glasses in chemical analysis. He observed the bluish shadows projected by the yellow light from the north in a clear sky behind various objects; also, that an object in front of an opening through which we look with both eyes may be invisible. It seems almost certain that he regarded light and sound as being produced in a similar manner, that is, by a series of waves.

In acoustics his researches were profitable. By studying echoes he concluded that sound requires a constant time to traverse a given distance. "It is possible to know by the ear the distance of thunder," he said, "if we have first seen the lightning, by analogy with the echo." He recognised that the action of wind interferes with the velocity of sound. Here is one of his experiments: "A blow given to a bell corresponds with and will communicate motion to another and similar bell; the string of a lute being struck will reply and give motion to a string of similar tone in another lute; and this can be rendered visible by placing a straw upon the string of the second lute." Of another acoustical problem he said: "Is the sound in the hammer or in the anvil? I say: seeing that the anvil is not suspended it cannot resound; but the hammer resounds from the leap it makes just after the blow; and were the anvil to resound .... just as a bell, no matter by what material it be struck, yields the same depth of tone, so would the anvil, struck by no matter what hammer.

If, therefore, you hear various sounds from hammers of various sizes, the sound proceeds from the hammer and not from the anvil."

Among what we may call the vagaries of Leonardo's scientific and inventive curiosity, we may mention designs for flying-ships, flying-men, and aërial chairs: but, should the secret of flight ever be discovered, and adapted to general use, it may turn out that his experiments were not so fantastic as they now appear. So, too, of his proposition to walk with wooden shoes on the water. In his youth he was fascinated by that chimera—perpetual motion—which still had a potent charm for investigators. But experience taught him wisdom and he called "sophistical" the arguments of those who were deluded as he had been. "It is impossible," he said, "to create by any instrument a movement of water from below to above, by means of the descent of which it shall be possible to raise a similar weight of water to the height from which this descended."

When we remember that four hundred years ago alchemy had not developed into the science of chemistry, nor astrology into astronomy, and that fact and superstition had parted company in but few minds, we shall realise more adequately the vigorous independence of Leonardo, who boldly cast off authority, and chose reason and nature as his guides. He not only called "sophistical" the attempt to demonstrate perpetual motion, and ridiculed those who wasted their time in trying to square the circle, but he also denounced alchemists as "liars." He, too, turned his insatiable curiosity to fantastic experiments, in order to make sure that he had overlooked no possible entrance into the mystery of the universe; but here, as elsewhere, he was deceived by no hallucinations, and accepted or rejected the products of his researches according to the sole standard of reason. He insists, in his "Treatise on Painting," on the infallibility of nature, "the mistress of masters." "A painter," he says, "ought never to imitate the manner of any other; because in that case he cannot be called the *child*, but the *grandchild*, of nature. It is always better to have recourse to nature, who is replete with just abundance of objects, than to the productions of other masters, who learnt everything from her." To her, therefore, he went in quest of scientific truth. He practised, a century before

Bacon, that inductive method which now obtains among all men of science. He preached the need of experiments. "Experience [or experiment] never deceives, but our judgments are deceived," is one of his maxims. "If then you ask me," he says, "'What fruit do your rules yield, or for what are they good?' I reply that they bridle investigators, and prevent them from promising impossibilities to themselves and others, and from being rated as fools or cheats." Four hundred years ago Leonardo rebuked spiritualistic frauds in this calm fashion: "There cannot be a voice where there is not motion and percussion of air: there cannot be a percussion of this air where there is no instrument; there can be no incorporeal instrument. This being so, a spirit can have neither voice, nor form, nor force, and if it takes body, it cannot penetrate nor enter where the doors are locked. And if any one should say through air collected and packed together spirit takes bodies of various forms, and through that means speaks and moves forcibly, to him I reply that where there are not nerves and bones force cannot be exercised in any motion caused by the pretended spirits."

Such is the epitome of Leonardo's discoveries—an epitome compiled almost wholly from the reports of those who have edited one volume alone of his autograph memoranda. A strange fatality has followed those manuscripts of his. At his death, he bequeathed them to his pupil Francesco Melzi, who took them back from France to Milan. There they were soon scattered, and no one could decipher them; for Leonardo wrote backwards, from right to left. It was supposed that he used a secret script, and for three hundred years nobody succeeded in reading it. When Napoleon invaded Italy he carried fourteen of these folio volumes to Paris, where they still remain. Others, including many drawings, are in England. One volume, the so-called "Codice Atlantico," is preserved at Milan; it alone has been carefully studied, and in part transcribed and photographed. What rich ore lies buried in the thousands of pages still unedited, may be inferred from what has already been brought to light.

To the accident of handwriting is due the long ignorance of the world of Leonardo's attainments in science and discovery. Gen-

erations of investigators, unaware of his work, gradually explored the fields which he had traversed, and when at length his memoranda were deciphered, science had in many directions passed beyond him. Later men had the credit of his forgotten discoveries. But the inventory of those discoveries suffices to establish his claim to rank among the supreme men of science of all time. Whatever may be the relative worth of any one of his investigations, there can be no dispute as to the absolute quality of his mind. His methods are the methods of experiment and observation by which man advances victoriously into the mystery which wraps him round.

Leonardo's contemporaries were unprepared to appreciate his scientific accomplishment. Even recent critics have deplored that one who had only four or five peers in art should waste his time in scientific inquiries. He lived so near to the mediæval superstition that his insight was mistaken for wizardry, and his researches into the properties of matter seemed whimsical or perverse. Doubtless, the incompleteness and multitude of his investigations hindered other men from understanding their importance. He did not publish his discoveries; he did not even arrange them in formal order for demonstration. Those many thick volumes are but note-books in which he jotted down day by day the experiments he was making, or the conclusions and axioms he had reached, in many subjects. At the outset, he probably intended to collect and classify these various memoranda in separate treatises, but the revelations came so fast that he had barely time to record them.

Had Adam been created at night, imagine with what astonishment he must have beheld the first faint dappling of dawn! How his wonder must have grown as the East became rosy, and the sun rolled above the horizon, and from some unseen source light was poured through the heavens and flooded the earth! Forms and then colors emerged from the darkness; sounds—of birds, of lisping foliage, the hum of insects, the ripple of brook, or quieter lapping of stream—emerged from the silence. With what delight, with what unworn curiosity must Adam have wandered amid this pageant and listened to this music: everything a miracle, untarnished by the

touch of any yesterdays; himself unconscious of time or bound, the personification of instant and immeasurable wonder.

To Leonardo the world unfolded itself in almost equal freshness, as it would to all of us if custom did not dull our perception. It was, indeed, a new world! The mediæval has looked and seen only the handiwork of Satan,—a chaos from which issued spasmodic miracles and caprice—a prison, in which the soul was detained for a few mortal years before it flew heavenwards. Leonardo looked upon this world and saw in it a divine creation, a cosmos of law, a home every nook of which had revelations for the soul. Like the Scandinavian god who could hear the grass grow, his senses were preternaturally keen. He penetrated the cuticle of things; nature lay transparent to his gaze. He saw the ebb-and-flow of cause and effect. In the least phenomenon he discerned the principle linking it to a class; in every object, in every creature he beheld the end of a clew which led back and up to the infinite. Thus almost at the beginning of the new age, he was the man whom Nature took into her confidence. To him she granted an apocalyptic vision of her secrets.

Subsequent investigators have gone farther. Every acre of the domain of science whose hither boundaries he explored, is now occupied by a specialist. But none has surpassed him in the highest qualities of a man of science—patience to analyse special facts without prejudice, and power to deduce general laws after having accumulated sufficient information. His were the qualities and the methods by which alone mankind are slowly rationalising the world in which we live. Less than any other man who died before our century would he be surprised at the advance in science and at the mechanical inventions of which we boast; for he had, what many men think they have, but have not, a vivid sense of the infinitude of the natural world and of the incalculable possibilities of human achievement. "What is that," he asks, "which does not give itself to human comprehension, and which, if it did, would not exist? It is the infinite, which, if it could so give itself, would be done and ended."

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PHILOSOPHY AND INDUSTRIAL LIFE.

AMONG the varied activities of men there are two which are often brought into contrast with one another. These are, on the one hand, the practical work, which is embodied mainly in industrial products, and, on the other hand, such purely intellectual labor as is represented by speculative philosophy. The two appear at times as if they came into contact, but are more commonly regarded as so divergent that they can scarcely have any interest in common. It is, therefore, for the sake of both, an important inquiry which seeks to determine the real relation in which they stand to each other. That relation may be conceived either in its empirical aspect as a matter of historical fact, or in its logical aspect as necessitated by rational law. In the former aspect there is one fact which it is mainly important to notice, as it counteracts a common prejudice on the subject. There is a wide-spread impression that industrial work is so incompatible with philosophical speculation, that the two appear almost in inverse proportion to one another. But the impression is founded on a very superficial reading of history. It is to a large extent a misinterpretation of facts which have their familiar origin in the essential limitations of human power. One obvious result of this limitation is found in the fact, that, if human energy is largely discharged in one direction, it must to a corresponding extent be withdrawn from others. But beyond this inevitable effect of human limitation, there is nothing in national history to countenance the impression that industrial activity has, in the experience of any community, been found to be incompatible with the philosophical spirit. So far is this from being the case, the real fact is

that philosophy has found a home mainly among those communities and those sections of a community, in which industrial enterprise has to some extent expelled the spirit and the ideals of a purely militant society.

It is not difficult to explain this fact. In the relation of philosophy to industrial life, as in the relations of social phenomena in general, each may be viewed as alternately cause and effect: in other words, the dominating category is that of reciprocal action. Taking philosophy, in the first instance, as an effect, it is obvious that industrial activity, and industrial activity alone, provides the external conditions that are necessary for the development of the philosophical spirit. A militant society, almost of necessity, absorbs the entire energy of its members in the struggle for existence. For either it must depend on the precarious supply to be obtained by plundering its neighbors, or it must wring from nature the means of subsistence by such primitive industries as the militant condition allows, and then protect these from the rapacity of neighbors that live by plunder. In either case the mere maintenance of society will be its supreme—its almost exclusive—concern. On the other hand, an industrial society, to the extent to which industrialism supplants military enterprise, tends to create that accumulated wealth, which relieves it from the incessant pressure of the struggle for existence, and enables it to set apart some of its members for that leisurely reflexion on the meaning of life, of which the products are philosophy and science and art. It may be added that the industrial spirit encourages also those internal conditions of thought and sentiment, which are favorable to philosophical activity.

If, on the other hand, philosophy is viewed as a cause, then it is obvious that, not only in its general influence upon the human mind, but also by the special character of that influence, it is as favorable to the industrial spirit as this is to it. For not only does the general habit of reflexion tend to cultivate those peaceful sentiments which are essential to the success and the continuance of industrial activity, but this activity is rendered all the more successful especially by reflecting on the ultimate significance and end of existence, inasmuch as the conception of that end must give a clearer

direction to all the aims of human exertion, and therefore to the special aims of industrial life.

We are thus, however, already carried beyond a purely empirical view of the relation between philosophy and industrial work : for not only do we thus see how industrialism is not inimical to philosophy, but we see philosophy repaying industrialism for its friendly services by opening wider and clearer views of its aims, giving to these something better than the mere impulses of the instinctive struggle for existence, directing them to their proper end by the guidance of reason. Accordingly we are led to inquire, what is the result of turning the light of philosophical reflexion upon the aims of industrial life, or, in other words, what is the view of those aims, which such reflexion suggests. Philosophy, being necessarily occupied with the ultimate meaning and purpose of existence, must, when reflected upon industrial life, endeavor to grasp the supreme end to which the particular aims of industrialism are subservient, as well as the means by which industrialism endeavors to reach that end.

I.

The end of industrial life. It ought to go without saying, that the supreme end of industrial activity must be identical with that of all activity : and yet the fact is one that is but imperfectly recognised, or its significance is but imperfectly understood. The fact is, indeed, strikingly indicated by the common language of industrial life, which has been adopted by economical science. Prevalent phraseology describes industrial life as occupied with the production and distribution of wealth, and this accordingly is said to form the subject of scientific economics : but even scientific explanations of this language are often extremely imperfect, when they are not misleading. The term wealth, by its very etymology, indicates that it properly denotes the condition of weal, of well-being. It is true that, in its ordinary use it is applied rather to external things than to an internal state, and we must of course continue to accept established usage as the criterion of propriety in the application of the term. But if the term is not to be abused by a vagueness which

empties it of all serviceable significance, it must be applied to those phenomena which form the external conditions of human weal.

This is more or less clearly implied in all the scientific definitions of wealth. For in every such definition it is recognised with but slight variation of language, that, in order to make any article a factor of wealth, it must possess the attribute which is technically known as utility: and utility is always explained to mean the adaptation of the article to satisfy some human want. The very terminology thus adopted, however, shows that the industrial aspect of wealth inevitably runs over into the ethical, and that nothing but an incomplete analysis can countenance the practice, which has been common in the political economy of the earlier part of this century, —the practice of drawing an absolute line of demarcation between economical and ethical problems. Again and again we are told in the literature of this period, that the science of economics can view things merely on the side of their utility, and that their utility means merely that they can satisfy any of the wants of men. Many articles, it is admitted, are applied to the gratification of petty vanities or even gross animal passions. It is regretted that men should indulge degrading wants. Economical science does not deny the moral aspect of things, or under-estimate its importance. It simply asserts that the economical is not the moral aspect. It maintains that, as long as men cultivate degrading wants, they will seek the objects by which these are gratified, they will give their labor and other valuable things in exchange for those objects, and such objects will thus, by their utility, possess economical value.

All this reasoning, it required no very stoical morality to avoid. The moralists of the utilitarian school were sufficient to have taught the utilitarian economists a nobler, as well as a more philosophical, conception of utility. For the utilitarian moralists, while giving to utility a definition essentially identical with that of the economists, interpret the definition with a truer, because a far wider, view of its implications. To the moralist, as to the economist, utility is the power of affording gratification: but in general the moralist refuses to admit that the meaning of this definition can be fully understood without taking into view the nature of the gratifications that are

sought. Even for the individual an action cannot be said to have real utility merely because it gives gratification for the moment. The real gratification of any human being must be the gratification derived from life as a whole: and the utility, that is, the goodness, of an action, even for the individual agent, can therefore never be calculated without reference to its motives and consequences. Accordingly, nearly all utilitarian moralists, from Epicurus down to John Stuart Mill, have maintained that our happiness is derived, not so much from the feelings of the moment, as from the fact that

> "We look before and after,
> And pine for what is not."

But if this is the case even when the question is limited to the individual, it must be much more obvious when the view is extended to society. Not only is it absurd to seek the happiness of certain members or classes without regard to the rest, but the genuine happiness of every community must imply some security for its permanence. In general also utilitarian moralists have endeavored to show,—with what success, need not be discussed,—that the happiness of the individual, when completely analysed, must be identical with that of society.

These considerations have not indeed been overlooked wholly by economical writers, or overlooked by them all: but it is rare to find, among the predominant school of economists in the earlier half of this century, a clear and steady recognition of the scientific truth, that the utility, upon which the economical value of a commodity depends, must involve implications essentially similar to those which characterise the utility that is supposed to determine the moral value of an action. If the utility, which makes an action morally good, must calculate the happiness of an individual's whole life, and even the happiness of the whole community to which he belongs, then, by parity of reasoning, the utility, which ranks a commodity among the economical goods of mankind, which makes a commodity a real constituent of wealth, must point to a happiness of the same wide range. It is the oversight of this reasoning that originates many shallow popular illusions with regard to the economical value of reckless extravagance and vicious indulgences, which stimulate the

production of certain commodities, and thus enable the producers to obtain from the wages of their labor the means of subsistence. It is true that it has become a common-place among economical writers to distinguish productive and unproductive consumption: but the familiarity of this distinction has not prevented even economists from overlooking at times its full significance. Consumption very often gets the credit of being productive if it results in any material product which is exchangeable in the markets of the world, even though the product may be adapted, while giving momentary pleasure, to impair the general happiness and productive power of its consumers, or even though it may be adapted, like the instruments of warfare, to destroy wealth. Thus the impression is gathered from some economical treatises, that a million gallons of whisky may be entered upon the inventory of a nation's wealth equally with a million barrels of flour, or that a million rifles make up the genuine wealth of the world equally with a million reaping machines. Unless this distinction is maintained in all its purport, not only is a color given to the illusions of vulgar thought, but there is no escape from the extravagant theory of the "Fable of the Bees." The very extravagance of this famous book has led some critics—I think, without reason—to look upon it as a bit of irony: but the essentially comical character of its extravagance makes it, whether intentionally or not, an ironical *reductio ad absurdum* of the idea that real wealth can be made up of articles which are inimical to the real, that is, the moral, well-being of a community.

These remarks have been based designedly on the utilitarian interpretation of the moral life, not from any desire to estimate the value of that interpretation, but simply because the language of utilitarian ethics is so naturally suggested by that of economical writers. The whole reasoning of these remarks, however, is independent on any peculiar ethical theory: and probably most thinkers would acknowledge that the reasoning gains force by the abandonment of utilitarianism. It thus appears that, on any ethical theory, philosophy will not allow an absolute separation of the industrial from the moral life of man, and that the wealth, which industry is occupied in producing, can, if genuine, be merely *the sum*

of those external or material conditions which are essential and favorable to morality.

II.

The method or means of attaining the end of industrial life. Wealth can be accumulated only in proportion as it is produced at the least possible cost, and distributed with the least possible waste: that is to say, the economical production and distribution of wealth form the method or means of attaining the end of industrial life. Accordingly the production and distribution of wealth form also the main subjects of economical science. Here again, however, as in the definition of wealth itself, the spirit of philosophy may fairly be called in to enlarge the conceptions with which the science of economy deals.

Thus, to begin with, production and distribution are very often separated with that sharpness of discrimination which is engendered and sometimes even enforced by the limitation of view characteristic of scientific specialism, but which is apt to be blurred, if not obliterated, in the vaster sweep of the philosophical mind, seeking the unification of all knowledge. It is impossible to explain production satisfactorily, as wholly independent of distribution. For, apart from other considerations, if an undue proportion of the wealth produced in any community finds its way into the hands of unproductive consumers, then the productive power of the community is crippled, not only by the want of capital, but also by the fact that a large proportion of the productive laborers are poorly fed, poorly clad, poorly housed, poorly provided with the means of moral and intellectual training, so that their energy as producers is seriously impaired. This has always been in the past, and continues to be at present, the chronic condition even of the most advanced industrial nations, and it forms one of the principal causes which prevent the world from producing the wealth that it might otherwise enjoy. Even, therefore, for the production of wealth, a community cannot be indifferent to its distribution; and, as a matter of fact, the undefined usages, as well as the definite laws, of all countries, have been largely concerned with the distribution of their wealth.

It will probably be allowed that the general thought, of which such social regulations are an outgrowth, is the idea of a right which a man acquires over any product of nature, when by his labor he communicates to it a utility which without his labor it would not have possessed. Even in communities of the rudest militant type, regulated mainly by

> "The simple plan,
> That they should take who have the power,
> And they should keep who can,"

there appears at times a dim conception of the right which a man acquires to the fruits of his labor, though the conception is perversely applied to labor which deprives another of the same right. At all events it is this right which civilised jurisprudence has endeavored to bring into ever clearer recognition: and what philosophy has to demand of economics is, that it shall not inculcate any industrial arrangement of society which is incompatible with the full recognition of this right. For philosophy, as the unification of all knowledge, the harmony of all the sciences, cannot admit that to be true in one science which is untrue in another. Accordingly the economical aims of society cannot be philosophically represented as out of harmony with the aims which are posited by jurisprudence and ethics: in other words, the production of the aggregate wealth of any community cannot be conceived to be independent on its equitable distribution among the individual members.

Accordingly it becomes an economical problem to devise a method by which the aggregate wealth produced in a community shall be equitably distributed among the producers, even though economical science may state the problem as seeking a method by which the aggregate wealth produced may be so distributed as most efficiently to promote further production. In the solution of the problem the economical theories predominant in the early part of this century, went almost exclusively in the direction of abolishing all restrictions upon individual freedom: and the function of the State in relation to industrial life was confined to restraining individuals from interfering with the freedom of each other. It is not difficult to trace the origin of this movement. It was but a ripple

on a great wave of thought and life, which was already flowing in full tide towards the middle of last century, and before the century closed had, in the irresistible sweep of the American and European revolutions, borne down the barriers erected to stem its progress. The fundamental idea of this movement was an interpretation of the old Stoical concept of *the state of nature*. According to this interpretation man, as well as every other being, is conceived as adapted, by the very constitution of his nature, to promote his own welfare; so that to secure that welfare nothing is required but to allow his nature free play by emancipating it from the artificial restrictions by which its full development is impeded. It is not necessary to illustrate the application of this concept, for example, to the education of the individual in the startling novelties of Rousseau's "Emile," and to the constitution of society in the equally startling paradoxes of his essay on the origin of inequalities among men. The great literary enthusiasm, which emancipated literature from the fetters of a rigid and often frigid classicism by the outburst of a fervid and sometimes eccentric romanticism, was an inspiration of the same movement.

It was the ideas of this movement applied to industrial life that originated the demand for freedom of trade; and in view of the industrial condition of the world at the time such a demand was not only intelligible, but irresistible by any rational thought. In some countries, such as France, it is difficult to understand how industry of any kind continued to survive under the innumerable oppressions of a mediæval thraldom which seem as if they had been designed to crush it out of existence. But even in Great Britain, though its comparative political freedom made it the admiration of the continental liberals, industrial life was fettered by restrictions which not only checked the manufacturing and mercantile enterprise of its own people, but originated the calamitous differences with its colonies, and much of the calamitous discontent of Ireland.

But Rousseau's conception of a state of nature, which logically leads to the abolition of all restrictions upon the industrial freedom of the individual, is philosophically as untenable as the opposite conception of Hobbes, which, by a characteristic logic, associated

itself with the most extreme absolutism in ecclesiastical as well as in political organisation. The truth is, as has been shown in many a literary phenomenon from Proudhon to Count Tolstoi, the theory of Rousseau cannot stop short of an absolute nihilism or anarchism, which denies the right of any social authority to restrict the action of individuals. Consequently, in its application to industrial life, demanding, as it does, an unlimited industrial freedom, the theory becomes unthinkable, that is, self-contradictory, under a complete analysis. For, while assuming that, if men are left to their natural impulses unchecked by any artificial restrictions of society, they will certainly seek and find their true welfare, it stands face to face with the fact, that unrestricted liberty of industrial competition, instead of bringing about an effective, peaceful co-operation among industrial workers, has actually realised a *bellum omnium contra omnes*, which seems to illustrate the theory of Hobbes rather than that of Rousseau with regard to the natural state of man. Now, without attempting even to hint at the manifold problems which this subject suggests, it is obvious that, under all its aspects, the individual must be treated, not as a solitary, but as essentially a member of society, forced into innumerable relations with his fellow-men. This is peculiarly evident in industrial life. Here we see in its most striking forms that division of labor which, from the time of Plato, has been recognised as the essential factor of political organisation. But the result of dividing industrial labor among the different members of the community is, that, as a rule, no individual produces all the necessaries even of his own existence, and that therefore he would be left in partial destitution if he could not supply his wants from the surplus products of the labor of others in exchange for the surplus products of his own. The complications of this industrial exchange, with the complications of divided labor from which they arise, form a familiar commonplace in social science, but a commonplace which it is extremely difficult to realise fully in imagination. Now, the theory of unrestricted individualism contends that all these complicated processes, in which the members of a community co-operate for the production and distribution of their wealth, can be most effectively carried on if each individual is left to act unfettered

by any restrictions of social authority. But the whole movement of industrial life contradicts this contention. It is true, as already remarked, that industrial success demanded the emancipation of industry from burdensome regulations and taxes which were never calculated to encourage productive enterprise. But restrictions of this nature must be distinguished from those which are simply the requirements of such concerted action as is necessary for efficiency in the production, and equity in the distribution, of wealth. For the progress of industrial life, with its ever-increasing complications, is rendering it more and more evidently impossible either for producers or for distributers to fulfil their social functions effectively without some mutual understanding of a more or less explicit kind. The disappearance of the small master-workman, the displacement of small industries carried on with the limited capital of individuals by vast enterprises requiring the united capital of joint-stock companies, the aggregation even of such companies in combinations vaster still:—these are perhaps the most striking features of the industrial era in which we live; and they are evidence of the growing conviction among the industrial workers of the world, that their work can no longer be carried on effectively except by concerted action taking the place of unrestricted competition.

The extent to which concert in individual activity may be effectively carried forms of course an extremely complicated problem; and many are deterred from facing the problem as they see lowering behind it the bugbear of Socialism. This name, with the offensive suggestions which it conveys to many minds, is at the same time so vague that it may well be avoided in the present discussion. It may be acknowledged that the name is sometimes unfortunately used to imply an extension of social interference with individual freedom, from which those do well to shrink who feel that the tyranny of society is already sufficiently galling, who feel that the hopes of humanity essentially depend on the development of individual responsibility and on the social order securing the free play of individual genius. But the establishment and enforcement of regulations to secure co-operation among industrial workers, and to avoid the enormous waste created by their present antagonisms,

would not in any way interfere with the real freedom of individuals. On the contrary, by guaranteeing, in a manner at present impossible, to every honest worker the fruit of his labors by providing him with the necessaries and even the reasonable comforts and luxuries of our material civilisation, it may fairly be assumed that the great body of the industrial army would be delivered from the cruel oppression of the incessant anxieties connected with the present struggle for existence, and would thus win the required leisure for entering into the spiritual inheritance which humanity has already attained, while many an individual, whose genius would be crushed amid the struggles of industrial competition, might enjoy opportunities of a development that would enrich the intellectual and moral civilisation of the world.

Nor is it necessary to assume that, if concerted action take the place of competition, individual or private property should disappear from industrial life. So many of the social virtues are indissolubly connected with the use of property, that it remains extremely doubtful whether the moral evolution of the human race, even when it has touched its culminating point, will eliminate the institution from society. In the pleasant academical circle which Epicurus gathered about him in his garden in Athens, a proposal was made to introduce community of property among the members, but it seems to have been at once negatived by the master, as out of harmony with the highest social virtue, implying, as it would, distrust among friends in the friendly generosity of each other. It may be, therefore, that the evolution of society, instead of introducing a forcible, external, legal communism, will rather inspire the old concept of property with a new ideal, and that the feverish eagerness with which property is sought under the present system will disappear when larger property, like every superiority over others, will obtrude upon the moral consciousness of its owner, not so much the idea of a right, as rather that of an obligation,—not so much a claim to be ministered unto, but an obligation to minister,—an obligation to place his property and even his life, if necessary, at the service of his fellow-men.

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THE MESSAGE OF MONISM TO THE WORLD.

WE LIVE in an age of the intensest mental growth. Science penetrates deeper and deeper into the secrets of being, teaching us at the same time the conditions of improvement and progress; while the results of our more complete insight into the nature of things have matured our whole trend of thought and rendered our world-conception more sober, more positive, and clearer. The new philosophy which is dawning upon mankind has been briefly called Monism, or the theory of oneness, which indicates that the world, we ourselves included, must be conceived as one great whole. All generalisations, such as matter, mind, and motion, are abstractions representing aspects of reality, but not entities or things-in-themselves by a combination of which the universe has been pieced together; and all our notions of nature can be formulated in exact statements, which, when properly understood, form one harmonious system of natural laws. Monism is the product of the scientific tendencies of our age; it is the principle that pervades them; it is their consummation, and in it the spirit of modern science is concentrated, as it were, in its quintessence. As such, Monism not only forms a centre for the various specialties of scientific research, throwing light upon their interrelations and their aims, but is also destined to penetrate the public mind, to rally, to render judicious, and to direct all efforts at reform, and to regenerate our entire spiritual life in all its various fields. We ask, therefore, what is the message of Monism to the world, and how can it quicken the main-springs of our social, ethical, artistic, and religious aspirations?

Philosophy is not mere theory; it is not an elaboration of ideas

without practical consequences; philosophy shapes our world-conception, and our world-conception gives color to our whole frame of mind and powerfully influences all our actions. Thus, it is the basis of all our thoughts and inclinations. It is the vital centre of our entire being, and only those ideas which touch it are of a sweeping importance. No progress is stable unless it begins here, and no reform is thoroughgoing unless it plunges its roots into these deepest convictions of our soul.

Monism has to struggle for existence, and must overcome the powers which still sway the mass of mankind. And these powers are very strong,—not because they possess much vitality, for they are dying off, and present the sad spectacle of stagnant indifference, but because they hang like a dead weight on the minds of men; their strength is the inertia of massive mountains, the organised life of which has been ossified in palæontological fossils. The era of transition, having given rise to many abortive endeavors to find a way of escape from the pharisaical dogmatism of the old supernaturalism, has ended in the intellectual death of philosophy, which has become satisfied with the negations of an indolent Agnosticism.

In discoursing upon Monism, I do not speak *pro domo*, I do not refer to my own philosophy, but mean that whole great movement in the realm of human thought which endeavors to work out a systematic world-conception upon the basis of a methodical observation of facts. On the other hand, when I speak of Agnosticism as being indolent, I here deliberately exclude both the inventor of the term and its chief representative. Far be it from me to brand their personal endeavors as indolent or to be blind to the great merits of their life-work. I cannot help, however, saying that their philosophical doctrines exercise a pernicious influence, which is obviously productive of indolence and indifference. Thus be it understood that when I speak of Agnosticism I mean the attitude of surrender which writes upon its colors the desperate motto *ignorabimus*, and maintains that the fundamental problems of life are unanswerable riddles.

Monism does not deny that there are and always will be unsolved problems; it is not the proclamation of a dogmatic omniscience; it simply maintains that knowledge is possible, and that the problems

which confront us, among them the very important practical problems of the principles of ethics, the ultimate authority of moral conduct, the nature of the soul and the destiny of the soul after death, are by no means unsolvable. Agnosticism, in rejecting the dogmas of our religious traditions, denies that we can know anything at all about God, soul, and immortality. Thus it discredits investigation, and, leading us into a blind alley, arrests intellectual progress. And so convenient is this attitude concerning the most important problems, the solutions of which, if boldly pronounced, are apt to give offence in some way or other, that the indolent and indifferent of all parties assume it; above all, the representatives of reaction parade it with an ostentatious pretence of breadth and liberalism. The natural consequence of it is that the children of our time have become shallow and exhibit a lamentable lack of character, which appears in the methods of education, in the productions of art, in the religion of our churches, and in the principles of moral conduct. Monism has a word to say on all these subjects. Monism does not overthrow the old traditions; it does not begin the world *ab ovo*; it does not destroy the harvest of millenniums. On the contrary, it embodies in itself the rich experience of past ages; it gathers the golden sheaves in its garners; it only winnows the wheat from the chaff, rejecting the false, the irrational, the hypocritical, the dead letter, and preserving the good, the true, and the truly religious. It prunes the future growth, it systematises, purifies, and elevates. It renovates the old faith; it transforms childlike dreams into distinct conceptions, and changes the fairy-tales of our religious hopes into scientific truths, pregnant with manly resolutions and fixed determinations. Thus, Monism brings into the world a new faith, which undertakes to move the mountains of agnostic incompetence and fashionable indifference.*

* My agnostic friends say that I am prejudiced against agnosticism, and that I do not understand its proper meaning. I repeat here what I have said on former occasions, that I am an adherent of the agnosticism of modesty, which remains conscious of how little we know, but I object to the agnosticism of arrogance, whose devotees dogmatically declare, "We do not know, and thus no one can know." It is true enough that the world as a whole and in all its details is wonderful; here we are, and here is the world in which we have developed; and we say with Goethe: "*Zum Erstaunen bin ich da!*" If that be the meaning of agnosticism, I

The message of Monism appeals to every man who is serious in the investigation of truth, and its applications to practical life are important. Laborers are wanted in all the various fields of human exertion.

Permit me here to sketch the suggestions of this message in three great fields: first, in the domain of practical psychology touching questions of education, the judiciary, and the treatment of criminals; secondly, in the domain of public life, choosing for special consideration the much neglected topic of art; and lastly, in the religious field of our church institutions.

I.

The central problem of psychology is concerned with the nature of the ego-conception. There are the ideas, "*I* think; *I* feel pain; *I* feel pleasure; *I* desire to do this, and it is *I* who do it." And by *I* we understand this whole personality of ours. The old psychology assumes the existence of a mysterious soul-entity which acts the part of the ego and is supposed to be the agent of our psychical activity. We need not enter here into a detailed explanation of all the difficulties into which this view implicates us, for they are innumerable and insurmountable, so that the last refuge of those who hold it is the agnostic position that the problem of the soul is too

am an agnostic. But our agnostic philosophers do not dwell on this feature of existence; in fact, I do not know that they mention it. Their explanation of agnosticism is different. An event, or a natural law, or any phenomenon, such as a rainbow, may be wonderful, glorious, astonishing, dazzling, or strangely surprising, and yet perfectly intelligible and comprehensible. This, in my opinion, is actually the case with existence. The world as a whole, the cosmic order and every detail of reality, is wonderful yet at the same time perfectly intelligible, and here I differ from the agnostic position. Agnosticism declares that existence is incomprehensible, and that the fundamental problems of existence, such as the existence of God, the nature of the mind, the origin of consciousness, the relation between soul and body, are absolutely unsolvable. This produces a comfortable but vain self-sufficiency in the minds of those who are either unwilling or unable to think a problem to the end; it acts as a check on progress and surrounds confusion of thought with a halo of apparent philosophical sublimity. See *Homilies of Science*, "The Questions of Agnosticism"; *Fundamental Problems*, "The Stronghold of Mysticism," pp. 213–220 and passim. See also the controversy on agnosticism in No. 212 of *The Open Court*. Concerning such questions as the squaring of the circle see *Fundamental Problems*, Second Edition, p. 283, "The Unsolvable Problem," and p. 291, "The Unanswerable Riddle."

deep for solution. A monistic psychology has no room for a metaphysical ego-entity; it shows with good arguments and proves by experiments, of which the most striking ones have been collected by Monsieur Ribot in his excellent psychological memoirs, that the idea of an ego-entity is an illusion. The thought "I" is one idea among many others, having grown into prominence by its frequent occurrence. The soul of man is comparable to a society or an organised state, the citizens of which are so many ideas, impulses, and volitions. At first sight this new soul-conception appears appalling, for it seems to be a negation of the existence of the soul, and it has actually become customary to characterise it as the psychology without a soul. This, however, is not so. The new psychology denies only an unwarranted assumption which, if it were true, would not add an iota to the dignity of the human soul; it only rejects an error, it protests against a superstitious, and, what is more, an injurious, misconception. The change which it brings about is similar to the advance of astronomy from the old Ptolemaic view, which mistook the earth for the centre of the world, to the Copernican system which regards it as one of the planets revolving around the sun. The illusion of the stability of the ego at the centre of our psychic activity is dispelled, but the reality of our soul remains the same as before. On the contrary, the world of mental life is extended not less than the new conception of the astronomical heavens; and the traditional dogma of immortality appears in a new light more glorious, more comforting, more elevating than the fantastic notion of a continued ego-existence in a heaven beyond the clouds.

The negation of the existence of the ego-entity, which many psychologists identify with the soul, is as old as Buddha and perhaps older; yet the application of this truth in the domain of religion is little appreciated and even misunderstood. Its representatives, as a rule, press only the negative side of this view, probably because they do not see the positive side and its great importance. It is as if some myth-poet had personified the day and spoke about it as the bearer of the sunlight, or the "subject" of which all the phases of solar radiance, from morning to night, were phenomenal aspects. Should, now, a philosopher come and explain the nature

of the day, declaring that day is not a subject of phenomenal events, not a bearer or metaphysical entity but only a name for a series of events, he might be denounced for nihilism and suspected of believing in the non-existence of light. Those who believe that day is an entity, regard sunset as the death of day. But in the soul-conception of monism death disappears as much as sunset ceases to be an event that touches the sun.

The practical applications of the new psychology demand, and have even partly brought about, a revision of our entire system of education from infancy to the psychical dietetics of the adult. We want poets who will give us in the place of the old silly doggerels new nursery rhymes, pictures and simple stories conveying instruction as well as moral truths in a telling way. No doubt improvements have been made, but we still look in vain for a model picture-book, perfectly adapted for babes just beginning to speak. Grimm's and other fairy-tales for children will have to be revised, but the revision must be made with an artist's hand; their beauties will have to be retained while their monstrosities must be removed or at least toned down. New tales must be added. The child of to-day who is accustomed to railway travelling and to the sight of machinery will be interested to hear, for example, that there was a time when no engines existed, and that the little boy who once watched the steam of the tea-kettle lift its lid, when he became a man invented the boiler and the cylinder in which the confined steam drives the piston and makes it perform work. It is not easy to reduce the experiences which most of us have had in later life to simple expressions fitted for the comprehension of children, but it is possible and necessary.

The methods of school instruction must be improved. When our educators consider the nature of mind and its growth from sense-impressions, they will, as much as possible, confront the pupil with facts. The principle of teaching by object-lessons must be carried up to the highest branches of physics and mathematics, not omitting languages. Train not only the mind by theories, but impart sensations. Have plenty of illustrations. Use to advantage wherever feasible the magic lantern in geography, in history, in

literature, and art. Teach Latin and Greek syntax in little stories which when learned by heart will naturally and without effort make the pupil apply grammatical rules correctly. It is possible to teach any language, Latin, Greek, or Hebrew, to a youth of average intelligence within a year so that he shall be able to understand it when spoken, and to read and write it. To train the ear by listening to the spoken language, the eye by the sight of printed words, the hand by writing them, and the mind by the abstract comprehension of rules, all at once, is in the long run not more difficult, but easier—namely, easier to the pupil—than a one-sided instruction. In the same way a long sentence of about three lines is more easily remembered than three disconnected words. The home work of our children can be greatly reduced if knowledge is imparted in a systematic and more impressive way. The problem is simply a matter of improved method, of building everything upon the strong foundation of a vivid sense-experience, of invoking the mutual assistance of the senses, and of concentrating all efforts upon points of practical importance. While we should expect more intensified work of our teachers we must at the same give them more leisure for preparation and study.

Splendid beginnings have been made with gymnastics and manual training, but they ought to be generally applied and need not be confined to manual training-schools and technical institutes.

Let us have less work and fewer lessons but more clearness in the presentation of the subjects of instruction in our schools. Drop what is redundant and introduce what is indispensable. Mathematics as a rule is too much neglected and where it is taught should receive more life and fervor. Mathematics need not be so dry and tedious as it is commonly regarded. A mathematical teacher should awaken in his scholars a holy enthusiasm for this most beautiful and divinest of sciences.

We must also change our attitude towards errors, mistakes, vices, and crimes. The old idea of retaliatory justice has been replaced by the two greatest religious teachers of the world, by Buddha and by Christ, who put in its stead an all-embracing compassion for the suffering. They taught a doctrine which has but lately been under-

stood. The monistic philosophy, it can truly be said, has discovered the scientific basis of Christian ethics. The principle of egotism has commonly been regarded as the natural law of moral conduct, and the higher view of superindividual maxims, it was claimed, could not have been naturally developed; it must have been proclaimed by a supernatural revelation. Monism, by dispelling the illusion of the ego, points out the way to a nobler system of ethics, not based upon supernatural revelations that stand in contradiction to the facts of nature but upon the higher evolution of nature in her best children who understand their mother better than do the lower and less perfected creatures, who thus in fact stand nearer to nature, and in this sense are more natural than they. Our modern world-conception considers that the criminal is the product of conditions. It may be necessary to shoot a tiger that is at large, but there is no sense in punishing him because he killed a man. Criminals have been classed with the insane, and treated as morally diseased. The amputation of an ulcerated or cancerous limb is no punishment of the limb, but a cure to protect the other limbs and save the life of the man. It must be remembered that we do not advocate a humane treatment of criminals from sentimental reasons which in their application often lead to a gross injustice toward those who suffer from the folly and brutality of criminals. We simply take the ground of treating men as we treat things, viz., according to their nature without any ill-will or hatred. I remember the lesson which I received while living in Europe from an old French landlady who in anger smashed a Chinese vase because she could not remove a stain as quickly as she wanted to. How often does the retaliatory justice of a barbarous past still lingering with us, destroy human souls from mere impatience.

Punishment is only justified as an educational or protective means, and as such, it ceases to be punishment in the original sense of the word. We have learned with Christ to hate sin while not hating the sinner, and to treat him with all the regard that his humanity demands

II.

Monism has not yet been able to exert its wholesome influence upon the public life of society and politics. We should always bear in mind that in the end all our institutions must serve to develop a higher humanity in man, more manliness, a prouder self-reliance, independence of character, better information, and nobler ideals. It is good for us Americans that we suffer from the ignorance of our voters, but we must not be satisfied with the present conditions. On the one hand, let us remove from our public life the temptations of the spoils-system, which often actually places a premium upon dishonesty, and favors the unscrupulous party-politician. On the other hand, let us consider that our republican institutions can be preserved only on the condition of a general progress of the intelligence and moral firmness of the average man.

Among many other reforms we demand a regeneration of the spirit of art. Art at present is degraded; it has become mere fashion and the representation of empty elegance. Technicalities have become the standard of artistic beauty, while philosophical depth and religious earnestness are omitted and almost discredited.

In former times the world-conception of the age sought embodiment in lofty creations of art. Every piece of art was the expression of the spirit of the times. Art was holy to the Egyptians, to the Greeks, to a Michael Angelo, a Holbein, a Dürer. The religion of the ancient artists speaks to us from the wonderful works of their hands. What is the art of to-day? It consists in the production of beautiful forms wrought out with refined skill by able artificers, but it is void of ideas, possesses no holy zeal, and is utterly lacking in meaning and purport. Why is there no Shakespeare living among us now, no Goethe, no Schiller? It is not because the necessary talent is absent in our young men, but because there is no demand for a poetry that will undertake to teach mankind and reflect the deepest philosophy of the day in a form in which it would be directly and intuitively understood. We cannot say that the people at large are averse to a treatment of the deepest

problems, for even comparatively weak novels on religious, philosophical, and social problems have proved a great temporary, although on account of their shortcomings, not a lasting success. The truth is, that our leaders in literature, our critics, our prominent artists, are infected with the Agnosticism of our age. As Agnosticism has pooh-poohed the manliness of having a definite conviction, the characteristic feature of the art of our age is to be void of character.

The first step toward this sorry condition of art was taken by a great man in a mistaken zeal for the liberation of art from the dogmatic world-conception of an antiquated and narrow-minded theology. Lessing pronounced in his great work on Laökoön the principle that art should be devoted to the representation of the beautiful and must not be subjected to the censorship of the moralist, who would only use it for the exposition of a bigoted Sunday-school morality. Lessing branded all creations of art that sought to be inspired by philosophical or religious ideals as tendency- or purpose-productions. With apparent justice he claimed art for art, dedicating the beautiful to the beautiful, and leaving the elaboration of truth to science and philosophy, or to religion. He was actuated in the enunciation of his erroneous principle by his zeal against the ruling dogmatism of his age, which actually choked all true art. Lessing did not consider that the beautiful cannot be separated from the true; that while the unreal may be sublime and noble, nay, even true, the untrue is always ugly; and that if art, by showing us the world or some part of the world, the inanimate nature of landscapes or the psychic nature of our souls, in the transfiguration of beauty, did not teach and instruct us, if it did not purify and elevate our minds, it would be like a sounding brass or a tinkling cymbal. Art ceases to be art and is mere artificiality as soon as it is nothing but beauty without truth, form without idea, pleasing creations without meaning.

The best refutation of Lessing's principle is given by himself; for as a poet he disregarded his own rules; and his best works, if not all, would have to be condemned as purpose-dramas. What are "Nathan the Wise," "Minna of Barnhelm," "The Jews," but

works of art that have a very obvious purpose; they teach moral lessons and are unmistakable expressions of his world-conception. The same is true of all other great dramas, such as "Antigone," "Hamlet," "Faust"; which were not written merely to make a display of literary beauty, but to incorporate the deepest religious and philosophical convictions of their poets. They please and teach at the same time; and concerning Lessing's dramas we know for certain that he actually intended them not so much to please as to teach. According to his own confession he used the stage as his pulpit.

It is a shame and a testimonial of our intellectual poverty that such senseless pieces as "The Babes in the Wood," and even worse productions, have been played to crowded houses, that they were praised by the press, and could be repeated in all our great cities more than a hundred times. Would that some wealthy man might found a theatre devoted to true art! The stage could be made a source of spiritual blessings more influential than the church. It would be a powerful factor in the regeneration of our age.

The most prominent philosopher of Agnosticism declares the origin and nature of art to consist in "the useless and superfluous exercise of human faculties." He identifies art with sport, from the practices of which he selects his explanatory examples, and finds the standard of its evolution-begotten perfection in its increasing complexity. From this conception of art the soul is gone; the only thing left is the skill of physical and mental acrobats. An organ solo would be superior to the playing of a piano, because the former is more complex, for while the pianist uses his hands only, the organist has to use also his feet; and the clown who plays the fiddle on horseback would rank higher than Paganini. Such is the agnostic idea of art! Since Agnosticism renders a positive conviction as to the nature of existence impossible, it is consistent with its main principle to take away from art its innermost meaning, its very soul and sacred purpose, which consists in being the expression of a world-conception. We children of a transitional age of indefiniteness are so imbued with this lack of character that the emptiness of our art-productions does no longer surprise us. The present generation, it seems, has lost the proper understanding for true art, because the

world-conception of the masses has become an empty blank; and there is no hope of reform until we regain for our convictions the religious earnestness and ardor which distinguishes all the great artists of former ages.

III.

If Monism is true, our entire religious life will have to undergo a radical change. The dual system of religious truth and scientific truth must go. We must face the fact that there is but one truth and that all different truths are but aspects of that one truth. Science is a religious revelation equally as grand as the Psalms of David and assuredly not less reliable than the visions of St. John.

Our religious leaders must recognise the principle of scientific investigation as the proper method of ascertaining religious truth. The churches must abandon the imposition of pledging the clergy to special dogmas; they might at their ordination pledge them to a reverence of the traditions of their special creeds, but should demand no higher vow than an allegiance to truth.

The present system of many great ecclesiastical institutions deliberately makes hypocrites of the teachers of the people, for it enjoins upon their consciences in a most solemn way some old-fashioned and indeed ridiculous tenets which it is impossible for any sane person of the present century to countenance. Not even the Archbishop of Canterbury can be suspected of believing all the thirty-nine articles of his church, and if he does, he has either to interpret their original meaning away, or to stretch his conscience.

The churches have to be broadened, but, on the other hand, our secular aspirations after progress have to be impressed with a religious spirit. The liberalism of our times, good as it is in its principles, often pursues wrong aims. Thus, in the interest of a strict impartiality toward all religions, ordinances are in force in some of the United States, which forbid the reading of the Bible in public schools. Can the interdiction of the most important collection of sacred literature that exists be called liberty? True, the idea is, not to let the children be impressed with any one of the various sectarian interpretations of the Scriptures, but shall our young men and wo-

men for that reason remain entirely ignorant of the contents of the Bible? The consequence is, that in this country where the mass of the people are unchurched, more than fifty per cent have never read the Bible; and truly, we might rather omit Homer or banish Shakespeare than the History of Israel, the Psalms, and the Gospels. I know the difficulty lies in the sectarian spirit in which our various sects want the Bible read, and its miracles literally believed, but why not let the churches give their own interpretation in their Sunday-schools while the public educational institutions give simply an exposition of facts.

We suggest going further still: not only from the Bible but also from the sacred literature of other religions should selections be read. There are some beautiful passages in the Koran, there is the magnificent Bhagavadgîtâ of the Hindus, there is the Tâo Tĕh King of Lâotsze, full of Christian ethics, although written six hundred years before Christ; there is the Buddhist Dhammapada, the sentiments of which are throughout as lofty as the most glorious passages of the New Testament. All these sacred writings should be household books in our homes, schools, and universities. Together with the Bible they should all be read, reread, and studied with diligence, for they offer us the spiritual bread that is needed so much in our public and private life.

It has been claimed that it is impossible to study religious subjects with impartiality, but why should it be so? If it is impossible now, we must make it possible. What has not been said to be impossible that afterwards has become an actual fact? We have had in this city that memorable gathering of the World's Parliament of Religions, which is a most wonderful event in history, the lesson of which has not as yet been generally learned or even appreciated. If our people understand its lessons they will not hesitate to teach religion in our public schools with all the impartiality that the love of truth demands.

It is quite possible to write a text-book adapted to the capacity of our children in the public schools which in large outlines would characterise the great religious systems of the world so that no one of their adherents would have cause to find fault with the statement,

and which at the same time would contain selections from the various sacred literatures. Shall we forbid the eating of bread because it is liable to become mouldy and poisonous? No, let us show our impartiality not by suppressing the most important discipline but by teaching the facts, so far as they are undeniable, in a way adapted to the age of the pupils and with due discretion so as to avoid unnecessary offence. But under all circumstances let truth be the ultimate tribunal of appeal.

Monism does not advocate a revolution in religion but a reform; yet the reform must be radical; it must dispose of all falsehood at the roots of our religious life.

Let me here express my conviction that the intellectual life of our ecclesiastical institutions is not as dead as it frequently appears to outsiders. The churches still contain powerful potentialities. Any one who cares to investigate matters will observe the thriving and sprouting of promising germs that are developing higher forms of religious life. There exist religious thinkers who take their stand upon the properly religious maxims of religion, who rigorously follow the truth, not only in judging themselves, but also their religious ideas, and in investigating the records of the Bible; who discriminate between the essential and accidental, and find the orthodox solution of difficulties not in the literal acceptance of the letter but in the spiritual meaning of the sacred traditions. They must in the end find the right solution of the religious problem, and will then be able to meet the demands of the so-called infidel world, which is slowly but surely learning to recognise the subtle but very real truths of spiritual and moral laws that obtain in nature.

While there are unmistakable symptoms of progress in many of our old established institutions, it is strange that the most liberal churches sometimes appear the most timid. They halt in their advance as though they were afraid of falling a prey to negativism. This is perhaps the reason why the Unitarianism of to-day shows less vitality than in the days of Channing and Parker. Our Unitarians and the other liberal churches must learn how to be conservative and progressive at the same time. Nor must they be afraid of struggle. Those movements only which have an aim, which are

inaugurated to do some work, which struggle for a cause and pursue an ideal, can be said to be living powers in the world.

There is a widely spread preconception on the subject of religious reform which is that if we begin at all it will finally lead to the utter extinction of religion. But we beg to differ from this view. We consider it as a necessity to carry reform, as demanded by science, to its most radical extreme. Religion will not suffer, but, on the contrary, be purified. The essence of all religion lies in the practical application of truth; the sole purpose of religion is to teach man ethics, to make him a moral enthusiast, to point out to him the way to salvation. And there is no other saviour but truth. Now there is no religion, be its dogmas ever so crude and irrational, but has in it the potentiality of developing into a religion of truth. There is no religion, be it ever so low, that does not purport to be, and can become, an ethical religion. Let but Christianity be true to the spirit of reform which Christ's injunctions breathe, and it will be found to be true. Many of those Christians who call themselves orthodox, spurn the search for truth undertaken by science for the sake of dogmas founded upon the views of well-intentioned but narrow-minded and ignorant men. They have nothing of the spirit of Christ. Verily, he who trusting in truth and believing in the oneness of truth embraces the simple faith in a religion of truth, is a better Christian than all the Christians in name. He is truly orthodox, that is, of right faith; he may discard the letter of Christianity, yet he preserves the spirit; he may protest against the literal interpretation of its mythology, yet he possesses its meaning; he may not be baptised, yet Christ's ideal of a superindividual life lives in his heart; the ethical faith of the religion of truth alone—of scientifically provable truth is—catholic, for no truth is catholic except it be demonstrated by science.

Monism bids the religious thinker be bold and use fearlessly his natural right, or rather obey his duty, of free investigation. The meaning of the old religions is true enough. What renders them objectionable is a clinging to the allegories of their faith and an unthinking acceptance of the symbol as if it were the truth itself. As soon as our churches begin to take the spirit of their religion seriously and to throw off the paganism of a worship of the letter, they

will develop a higher orthodoxy, which can never come in conflict with science and will exhibit an unexpected agreement with the conclusions of a most radical and fearless Monism.

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The new world-conception grounded upon the facts of experience as stated with the scrupulous methods of exact science and systematised by a positive and monistic philosophy, throws light upon all the provinces of human exertion. It brings into full consciousness many aspirations which have so far only been the expression of instinctive promptings. It helps us to understand the nature of our own self, the destiny of our life, and the aim of our holiest ideals. It gives direction to all our yearnings and fulfils all legitimate hopes; it gathers the harvest of the past, and brings everything to a consummation, which, however, will only be the starting-point of a higher development with broader outlooks and infinitely greater possibilities in all the domains of human exertion.

EDITOR.

MONISM IN ARITHMETIC.

IN HIS "Primer of Philosophy," Dr. Paul Carus, the able editor of this magazine, defines monism as a "unitary conception of the world." Similarly, we shall understand by monism in a science the unitary conception of that science. The more a science advances the more does monism dominate it. An example of this is furnished by physics. Whereas formerly physics was made up of wholly isolated branches, like Mechanics, Heat, Optics, Electricity, and so forth, each of which received independent explanations, physics has now donned an almost absolute monistic form, by the reduction of all phenomena to the *motions* of molecules. For example, optical and electrical phenomena, we now know, are caused by the undulatory movements of the ether, and the length of the ether-waves constitutes the sole difference between light and electricity.

Still more distinctly than in physics is the monistic element displayed in pure arithmetic, by which we understand the theory of the combination of two numbers into a third by addition and the direct and indirect operations springing out of addition. Pure arithmetic is a science which has completely attained its goal, and which can prove that it has, exclusively by internal evidence. For it may be shown on the one hand that besides the seven familiar operations of addition, subtraction, multiplication, division, involution, evolution, and the finding of logarithms, no other operations are definable which present anything essentially new; and on the other hand that fresh extensions of the domain of numbers beyond irrational, imaginary, and complex numbers are arithmetically impossible. Arithmetic may be compared to a tree that has completed its growth,

the boughs and branches of which may still increase in size or even give forth fresh sprouts, but whose main trunk has attained its fullest development.

Since arithmetic has arrived at its maturity, the more profound investigation of the nature of numbers and their combinations shows that a unitary conception of arithmetic is not only possible but also necessary. If we logically abide by this unitary conception, we arrive, starting from the notion of counting and the allied notion of addition, at all conceivable operations and at all possible extensions of the notion of number. Although previously expressed by Grassmann, Hankel, E. Schröder, and Kronecker, the author of the present article, in his "System of Arithmetic," Potsdam, 1885, was the first to work out the idea referred to, fully and logically and in a form comprehensible for beginners. This book, which Kronecker in his "Notion of Number," an essay published in Zeller's jubilee work, makes special mention of, is intended for persons proposing to learn arithmetic. As that cannot be the object of the readers of this magazine, whose purpose will rather be the study of the logical construction of the science from some single fundamental principle, the following pages will simply give of the notions and laws of arithmetic what is absolutely necessary for an understanding of its development.

The starting-point of arithmetic is the idea of counting and of number as the result of counting. On this subject, the reader is requested to read the author's article in the last number of *The Monist* (p. 396). It is there shown that the idea of addition springs immediately from the idea of counting. As in counting it is indifferent in what order we count, so in addition it is indifferent, for the sum, or the result of the addition, whether we add the first number to the second or the second to the first. This law, which in the symbolic language of arithmetic, is expressed by the formula

$$a + b = b + a,$$

is called the *commutative law* of addition. Notwithstanding this law, however, it is evidently desirable to distinguish the two quantities which are to be summed, and out of which the sum is produced, by special names. As a fact, the two summands usually are distin-

guished in some way, for example, by saying a is to be increased by b, or b is to be added to a, and so forth. Here, it is plain, a is always something that is to be increased, b the increase. Accordingly it has been proposed to call the number which is regarded in addition as the passive number or the one to be changed, the *augend*, and the other which plays the active part, which accomplishes the change, so to speak, the *increment*. Both words are derived from the Latin and are appropriately chosen. Augend is derived from *augere*, to increase, and signifies that which is to be increased; increment comes from *increscrere*, to grow, and signifies as in its ordinary meaning what is added.

Besides the commutative law one other follows from the idea of counting—the *associative law* of addition. This law, which has reference not to two but to three numbers, states that having a certain sum, $a+b$, it is indifferent for the result whether we increase the increment b of that sum by a number, or whether we increase the sum itself by the same number. Expressed in the symbolic language of arithmetic this law reads,

$$a+(b+c)=(a+b)+c.$$

To obtain now all the rules of addition we have only to apply the two laws of commutation and association above stated, though frequently, in the deduction of the same rule, each must be applied many times. I may pass over here both the rules and their establishment.

In addition, two numbers, the augend a and the increment b are combined into a third number c, the sum. From this operation spring necessarily two inverse operations, the common feature of which is, that the sum sought in addition is regarded in both as known, and he difference that in the one the augend also is regarded as known, and in the other the increment. If we ask what number added to a gives c, we seek the increment. If we ask what number increased by b gives c, we seek the augend. As a matter of reckoning, the solution of the two questions is the same, since by the commutative law of addition $a+b=b+a$. Consequently, only one common name is in use for the two inverses of addition, namely, *subtraction*. But with respect to the notions involved, the two oper-

ations do differ, and it is accordingly desirable in a logical investigation of the structure of arithmetic, to distinguish the two by different names. As in all probability no terms have yet been suggested for these two kinds of subtraction, I propose here for the first time the following words for the two operations, namely, *detraction* to denote the finding of the increment, and *subtertraction* to denote the finding of the augend. We obtain these terms simply enough by thinking of the augmentation of some object already existing. For example, the cathedral at Cologne had in its tower an augend that waited centuries for its increment, which was only supplied a few decades ago. As the cathedral had originally a height of one hundred and thirty metres, but after completion was increased in height twenty-six metres, of the total height of one hundred and fifty-six metres one hundred and thirty metres is clearly the augend and twenty-six metres the increment. If, now, we wished to recover the augend we should have to pull down (Latin, *detrahere*) the upper part along the whole height. Accordingly, the finding of the augend is called *detraction.* If we sought the increment, we should have to pull out the original part from beneath (Latin, *subtertrahere*). For this reason, the finding of the increment is called *subtertraction.* Owing to the commutative law, the two inverse operations, as matters of computation, fall into one, which bears the name of *subtraction.* The sign of this operation is the minus sign, a horizontal stroke. The number which originally was sum, is called in subtraction minuend; the number which in addition was increment is now called detractor; the number which in addition was augend is now called subtertractor. Comprising the two conceptually different operations in one single operation, subtraction, we employ for the number which before was increment or augend, the term subtrahend, a word which on account of its passive ending is not very good, and for which, accordingly, E. Schröder proposes to substitute the word *subtrahent*, having an active ending. The result of subtraction, or what is the same thing, the number sought, is called the *difference.* The definition-formula of subtraction reads

$$a - b + b = a,$$

that is, a minus b is the number which increased by b gives a, or

the number which added to b gives a, according as the one or the other of the two operations inverse to addition is meant. From the formula for substraction, and from the rules which hold for addition, follow now at once the rules which refer to both addition and subtraction. These rules we here omit.

From the foregoing it is plain that the minuend is necessarily larger than the subtrahent. For in the process of addition the minuend was the sum, and the sum grew out of the union of *two* natural number-pictures.* Thus 5 minus 9, or 11 minus 12, or 8 minus 8, are combinations of numbers *wholly destitute of meaning*; for no number, that is, no result of counting, exists that added to 9 gives the sum 5, or added to 12 gives the sum 11, or added to 8 gives 8. What, then, is to be done? Shall we banish entirely from arithmetic such meaningless unions of numbers; or, since they have no meaning, shall we rather invest them with one? If we do the first, arithmetic will still stick in the strait-jacket in which it is forced by the original definition of number as the result of counting. If we adopt the latter alternative we are forced to extend our notion of number. But in doing this, we sow the first seeds of the science of pure arithmetic, an organic body of knowledge which fructifies all other provinces of science.

What significance, then, shall we impart to the symbol

$$5-9?$$

Since 5 minus 9 possesses no significance whatever, we may, of course, impart to it any significance we may wish. But as a matter of practical convenience it should be invested with no meaning that is likely to render it subject to exceptions. As the form of the symbol $5-9$ is the form of a difference, it will be obviously convenient to give it a meaning which will allow us to reckon with it as we reckon with every other real difference, that is, with a difference in which the minuend is larger than the subtrahent. This being agreed upon, it follows at once that all such symbols in which the number before the minus sign is less than the number behind it by the same amount may be put equal to one another. It is practical,

* See the article "Notion and Definition of Number" in the last *Monist*.

therefore, to comprise all these symbols under some one single symbol, and to construct this latter symbol so that it will appear unequivocally from it by how much the number before the minus sign is less than the number behind it. This difference, accordingly, is written down and the minus sign placed before it.

If the two numbers of such a differential *form* are equal, a totally new sign must be invented for the expression of the fact, having no relation to the signs which state results of counting. This invention was not made by the ancient Greeks, as one might naturally suppose from the high mathematical attainments of that people, but by Hindu Brahman priests at the end of the fourth century after Christ. The symbol which they invented they called *tsiphra*, empty, whence is derived the English *cipher*. The form of this sign has been different in different times and with different peoples. But for the last two or three centuries, since the symbolic language of arithmetic has become thoroughly established as an international character, the form of the sign has been 0 (French *zéro*, German *null*).

In calling this symbol and the symbols formed of a minus sign followed by a result of counting, *numbers*, we widen the province of numbers, which before was wholly limited to results of counting. In no other way can zero and the negative numbers be introduced into arithmetic. No man can *prove* that 7 minus 11 is equal to 1 minus 5. Originally, both are meaningless symbols. And not until we agree to impart to them a significance which allows us to reckon with them as we reckon with real differences are we led to a statement of identity between 7 minus 11 and 1 minus 5. It was a long time before the negative numbers mentioned acquired the full rights of citizenship in arithmetic. Cardan called them, in his *Ars Magna*, 1545, *numeri ficti* (imaginary numbers), as distinguished from *numeri veri* (real numbers). Not until Descartes, in the first half of the seventeenth century, was any one bold enough to substitute *numeri ficti* and *numeri veri* indiscriminately for the same letter of algebraic expressions.

We have invested thus combinations of signs originally meaningless, in which a smaller number stood before than after a minus sign, with a meaning which enables us to reckon with such *apparent*

differences exactly as we do with ordinary differences. Now it is just this practical shift of imparting meanings to combinations, which logically applied deduces naturally the whole system of arithmetic from the idea of counting and of addition, and which we may characterise, therefore, as the *foundation-principle* of its whole construction. This principle, which Hankel once called the *principle of permanence*, but which I prefer to call the PRINCIPLE OF NO EXCEPTION, may be stated in general terms as follows:

In the construction of arithmetic every combination of two previously defined numbers by a sign for a previously defined operation (plus, minus, times, etc.) shall be invested with meaning, even where the original definition of the operation used excludes such a combination; and the meaning imparted is to be such that the combination considered shall obey the same formula of definition as a combination having from the outset a signification, so that the old laws of reckoning shall still hold good and may still be applied to it.

A person who is competent to apply this principle rigorously and logically will arrive at combinations of numbers whose results are termed irrational or imaginary with the same necessity and facility as at the combinations above discussed, whose results are termed negative numbers and zero. To think of such combinations as *results* and to call the products reached also "numbers" is a misuse of language. It were better if we used the phrase *forms of numbers* for all numbers that are not the results of counting. But *usus tyrannus!*

It will now be my task to show how all numbers at which arithmetic ever has arrived or ever can arrive naturally flow from the simple application of the principle of no exception.

Owing to the commutative and associative laws for addition it is wholly indifferent for the result of a series of additive processes in what order the numbers to be summed are added. For example,

$$a+(b+c+d)+(e+f)=(a+b+c)+(d+e)+f.$$

The necessary consequence of this is that we may neglect the consideration of the order of the numbers and give heed only to what the quantities are that are to be summed, and, when they are equal, take note of only two things, namely, of what the quantity which is

to be repeatedly summed is called and how often it occurs. We thus reach the notion of multiplication. To multiply *a* by *b* means to form the sum of *b* numbers each of which is called *a*. The number conceived summed is called the multiplicand, the number which indicates or counts how often the first is conceived summed is called the multiplier.

It appears hence, that the multiplier must be a result of counting, or a number in the original sense of the word, but that the multiplicand may be any number hitherto defined, that is, may also be zero or negative. It also follows from this definition that though the multiplicand may be a concrete number the multiplier cannot. Therefore, the commutative law of multiplication does not hold when the multiplicand is concrete. For, to take an example, though there is sense in requiring four trees to be summed three times, there is no sense in conceiving the number three summed "four trees times." When, however, multiplicand and multiplier are unnamed results of counting, (abstract numbers,) two fundamental laws hold in multiplication, exactly analogous to the fundamental laws of addition, namely, the law of commutation and the law of association. Thus,

$$a \text{ times } b = b \text{ times } a,$$

$$\text{and, } a \text{ times } (b \text{ times } c) = (a \text{ times } b) \text{ times } c.$$

The truth and correctness of these laws will be evident, if keeping to the definition of multiplication as an abbreviated addition of equal summands, we go back to the laws of addition. Owing to the commutative law it is unnecessary, for purposes of practical reckoning, to distinguish multiplicand and multiplier. Both have, therefore, a common name: *factor*. The result of the multiplication is called the product; the symbol of multiplication is a dot (.) or a cross ($\times$), which is read "times." Joined with the fundamental formula above written are a group of subsidiary formulæ which give directions how a sum or difference is multiplied and how multiplication is performed with a sum or difference. I need not enter, however, into any discussion of these rules here.

As the combination of two numbers by a sign of multiplication has no significance according to our definition of multiplication,

when the multiplier is zero or a negative number, it will be seen that we are again in a position where it is necessary to apply the above explained principle of no exception. We revert, therefore, to what we above established, that zero and negative numbers are symbols which have the form of differences, and lay down the rule that multiplications with zero and negative numbers shall be performed exactly as with real differences. Why, then, is minus one times minus one, for example, equal to plus one? For no other reason than that minus one can be multiplied with an ordinary difference, as, for example, 8 minus 5, by first multiplying by 8, then multiplying by 5, and subtracting the differences obtained, and because agreeably to the principle of no exception we must say that the multiplication must be performed according to exactly the same rule with a symbol which has the *form* of a difference whose minuend is less by one than its subtrahent.

As from addition two inverse operations, detraction and subtertraction, spring, so also from multiplication two inverse operations must proceed which differ from each other simply in the respect that in the one the multiplicand is sought and in the other the multiplier. As matters of computation, these two inverse operations again meet in a single operation, namely, division, owing to the validity of the commutative law in multiplication. But in so far as they are different ideas, they must be distinguished. As most civilised languages distinguish the two inverse processes of multiplication in the case in which the multiplicand is a line, we will adopt for arithmetic a name which is used in this exception. Let us take this example,

$$4\ \textit{yards} \times 3 = 12\ \textit{yards}.$$

If twelve yards and four yards are given, and the multiplier 3 is sought, I ask, how many summands, each equal to four yards, give twelve yards, or, what is the same thing, how often I can lay a length of four yards on a length of twelve yards. But this is *measuring*. Secondly, if twelve yards and the number 3 are given, and the multiplicand four yards is sought, I ask what summand it is which taken three times gives twelve yards, or, what is the same thing, what part I shall obtain if I cut up twelve yards into three equal parts. But this is partition, or *parting*. If, therefore, the multi-

plier is sought we call the division *measuring*, and if the multiplicand is sought, we call it *parting*. In both cases the number which was originally the product is called the dividend. and the result the quotient. The number which originally was multiplicand is called the measure; the number which originally was multiplier is called the parter. The common name for measure and parter is divisor. The common symbol for both kinds of division is a colon, a horizontal stroke, or a combination of both. Its definitional formula reads,

$$(a \div b) \,.\, b = a, \text{ or, } \frac{a}{b} \,.\, b = a.$$

Accordingly, dividing a by b means, to find the number which multiplied by b gives a, or to find the number *with* which b must be multiplied to produce a. From this formula, together with the formulæ relative to multiplication, the well-known rules of division are derived, which I here pass over.

In the dividend of a quotient only such numbers can have a place which are the product of the divisor with some previously defined number. For example, if the divisor is 5 the dividend can only be 5, 10, 15, and so forth, and 0, —5, —10 and so forth. Accordingly, a stroke of division having underneath it 5 and above it a number different from the numbers just named is a combination of symbols having no meaning. For example, $\frac{3}{6}$ or $\frac{1}{6}^2$ are meaningless symbols. Now, conformably to the principle of no exception we must invest such symbols which have the form of a quotient without their dividend being the product of the divisor with any number yet defined, with a meaning such that we shall be able to reckon with such apparent quotients as with ordinary quotients. This is done by our agreeing always to put the product of such a quotient form with its divisor equal to its dividend. In this way we reach the definition of broken numbers or *fractions*, which by the application of the principle of no exception spring from division exactly as zero and negative numbers sprang from subtraction. The latter had their origin in the impossibility of the subtraction; the former have their origin in the impossibility of the division. Putting

together now both these extensions of the domain of numbers, we arrive at *negative fractional numbers.*

We pass over the easily deduced rules of computation for fractions and shall only direct the reader's attention to the connexion which exists between fractional and non-fractional or, as we usually say, whole numbers. Since the number 12 lies between the numbers 10 and 15, or, what is the same thing, $10 < 12 < 15$, and since $10:5=2$, $15:5=3$, we say also that 12:5 lies between 2 and 3, or that

$$2 < \tfrac{12}{5} < 3.$$

In itself, the notion of "less than" has significance only for results of counting. Consequently, it must first be stated what is meant when it is said that 2 is less than $\frac{12}{5}$. Plainly, nothing is meant by this except that 2 times 5 is less than 12. We thus see that every broken number can be so interpolated between two whole numbers differing from each other only by 1 that the one shall be smaller and the other greater, where smaller and greater have the meaning above given.

From the above definitions and the laws of commutation and association all possible rules of computation follow, which in virtue of the principle of no exception now hold indiscriminately for all numbers hitherto defined. It is a consequence of these rules, again, that the combination of two such numbers by means of any of the operations defined must in every case lead to a number which has been already defined, that is, to a positive or negative whole or fractional number, or to zero. The sole exception is the case where such a number is to be divided by zero. If the dividend also is zero, that is, if we have the combination $\frac{0}{0}$, the expression is one which stands for any number whatsoever, because any number whatsoever, no matter what it is, if multiplied by zero gives zero. But if the dividend is not zero but some other number a, be it what it will, we get a quotient form to which *no* number hitherto defined can be equated. But we discover that if we apply the ordinary arithmetical rules to $a \div 0$ all such forms may be equated to one another both when a is positive and also when a is negative. We may therefore invent two new signs for such quotient forms, namely $+\infty$ and

$-\infty$. We find, further, that in transferring the notions greater and less to these symbols, $+\infty$ is greater than any positive number, however great, and $-\infty$ is smaller than any negative number, however small. We read these new signs, accordingly, "plus infinitely great" and "minus infinitely great."

But even here arithmetic has not reached its completion, although the combination of as many previously defined numbers as we please by as many previously defined operations as we please will still lead necessarily to some previously defined number. Every science must make every possible advance, and still one step in advance is possible in arithmetic. For in virtue of the laws of commutation and association, which also fortunately obtain in multiplication, just as we advance from addition to multiplication, so here again we may ascend from multiplication to *an operation of the third degree*. For, just as for $a+a+a+a$ we read $4.a$, so with the same reason we may introduce some more abbreviated designation for $a.a.a.a$. The introduction of this new operation is in itself simply a matter of convenience and not an extension of the ideas of arithmetic. But if after having introduced this operation we repeatedly apply the monistic principle of arithmetic, the principle of no exception, we reach new means of computation which have led to undreamt of advances not only in the hands of mathematicians but also in the hands of natural scientists. The abbreviated designation mentioned, which, fructified by the principle of no exception, can render science such incalculable services, is simply that of writing for a product of b factors of which each is called a, a^b, which we read a to the b^{th} power. Here a new direct operation, that of *involution*, is defined, and from now on we are justified in distinguishing operations which are not inverses of others, as addition, multiplication, and involution, by *numbers of degree*. Addition is the direct operation of the first degree, multiplication that of the second degree, and involution that of the third degree. In the expression a^b the passive number a is called the *base*, the active number b the *exponent*, the result, the *power*.

But whilst in the direct operations of the first and second degree, the laws of commutation and association hold, here in involu-

tion, the operation of third degree, the two laws are inapplicable, and the result of their inapplicability is that operations of a still higher degree than the third form no possible advancement of pure arithmetic. The product of b factors a is not equal to the product of a factors b; that is, the law of commutation does not hold. The only two different integers for which a to the b^{th} power is equal to b to the a^{th} power are 2 and 4, for 2 to the 4^{th} power is 16, and 4 to the second power also is 16. So, too, the law of association as a general rule does not hold. For it is hardly the same thing whether we take the $(b^c)^{th}$ power of a or the c^{th} power of a^b.

From the definition of involution follow the usual rules for reckoning with powers, of which we shall only mention one, namely, that the $(b-c)^{th}$ power of a is equal to the result of the division of a to the b^{th} power by a to the c^{th} power. If we put here c equal to b, we are obliged, by the principle of no exception, to put a to the 0^{th} power equal to 1; a new result not contained in the original notion of involution, for that implied necessarily that the exponent should be a result of counting. Again, if we make b smaller than c we obtain a *negative exponent*, which we should not know how to dispose of if we did not follow our monistic law of arithmetic. According to the latter, a to the $(b-c)^{th}$ power must still remain equal to a^b divided by a^c even when b is smaller than c. Whence follows that a to the minus d^{th} power is equal to 1 divided by a to the d^{th} power, or to take specific numbers, that 3 to the minus 2^{nd} power is equal to $\frac{1}{9}$.

At this point, perhaps, the reader will inquire what a raised to a fractional power is. But this can be explained only when we have discussed the inverse processes of involution, to which we now pass.

If $a^b=c$, we may ask two questions: first, what the base is which raised to the b^{th} power gives c; the second, what the exponent of the power is to which a must be raised to produce c. In the first case we seek the base, and term the operation which yields this result *evolution*; in the second case we seek the exponent and call the operation which yields this exponent, the *finding of the logarithm*. In the first case, we write $\sqrt[b]{c}=a$ (which we read, the b^{th} root of c is equal to a), and call c the *radicand*, b the *exponent of the root*, and a

the *root*. In the second case, we write $\log_a c = b$ (which we read, the logarithm of c to the base a is equal to b), and call c the *logarithmana* or *number*, a the *base of the logarithm*, and b the *logarithm*.

While, owing to the validity of the law of commutation in addition and multiplication, the two inverse processes of those operations are identical so far as computation is concerned, here in the case of involution the two inverse operations are in this regard essentially different, for in this case the law of commutation does not hold.

From the definitional formulæ for evolution and the finding of logarithms, namely,

$$(\sqrt[b]{c})^b = c, \text{ and } (a)^{\log_a c} = c,$$

follow, by the application of the laws of involution, the rules for computation with roots and logarithms. These rules we pass over here, only remarking, first, that for the present $\sqrt[b]{c}$ has meaning only when c is the b^{th} power of some number already defined; and, secondly, that for the present also $\log_a c$ has meaning only when c can be produced by raising the number a to some power which is a number already defined. In the phrase "has only meaning for the present" is contained a possibility of new extensions of the domain of number. But before we pass to those extensions we shall first make use of the idea of evolution just defined to extend the notion of power also to cases in which the exponent is a fractional number.

According to the original definition of involution, a^b was meaningless except where b was a result of counting. But afterwards, even powers which had for their exponents zero or a negative integer could be invested with meaning. Now we have to consider the arithmetical combination "a raised to the fractional power $\frac{p}{q}$." The principle of no exception compels us to give to the arithmetical combination "a to the $\frac{p}{q}^{th}$ power" a significance such that all the rules of computation will hold with respect to it. Now, one rule that holds is, that the m^{th} power of the n^{th} power of a is equal to the $(m \times n)^{th}$ power of a. Consequently, the q^{th} power of a raised to the $\frac{p}{q}^{th}$ power must be equal to a raised to a power whose exponent is equal to $\frac{p}{q}$ times q. But the last-mentioned product gives, according to the definition of division, the number p. Consequently the sym-

bol a to the $\frac{p}{q}^{th}$ power is so constituted that its q^{th} power is equal to a to the p^{th} power, that is, is equal to the q^{th} root of a^p. Similarly, we find that the symbol "a to the minus $\frac{p}{q}^{th}$ power" must be put equal to 1 divided by the q^{th} root of a to the p^{th} power, if we are to reckon with this symbol as we do with real powers. Again, just as a to the b^{th} power is invested with meaning when b is a fractional number, so some meaning harmonious with the principle of no exception must be imparted to the b^{th} root of c where b is a positive or negative fractional number. For example, the three-fourthsth root of 8 is equal to 8 to the $\frac{4}{3}$ power, that is, to the cube root of 8 to the 4^{th} power, or 16.

The principle underlying arithmetic now also compels us to give to the symbol the "b^{th} root of c" a meaning when c is not the b^{th} power of any number yet defined. First, let c be any *positive* integer or fraction. Then always to be able to reckon with the b^{th} root of c in the same way that we do with extractible roots, we must agree always to put the b^{th} power of the b^{th} root of c equal to c—for example, $(\sqrt[2]{3})^2$ always exactly equal to 3. A careful inspection of the new symbols, which we will also call numbers, shows, that though no one of them is exactly equal to a number hitherto defined, yet by a certain extension of the notions greater and less, two numbers of the character of numbers already defined may be found for each such new number, such that the new number is greater than the one and less than the other of the two, and that further, these two numbers may be made to differ from each other by as small a quantity as we please. For example,

$$(\tfrac{7}{5})^3 = \tfrac{343}{125} = 2\tfrac{93}{125} < 3 < 3\tfrac{3}{8} = \tfrac{27}{8} = (\tfrac{3}{2})^3.$$

The number 3, as we see, is here included between two limits which are the third powers of two numbers $\frac{7}{5}$ and $\frac{3}{2}$ whose difference is $\frac{1}{10}$. We could also have arranged it so that the difference should be equal to $\frac{1}{100}$, or to any specified number, however small. Now, instead of putting the symbol "less than" between $(\frac{7}{5})^3$ and 3, and between 3 and $(\frac{3}{2})^3$, let us put it between their third roots; for example, let us say:

$\frac{7}{5} < \sqrt[3]{3} < \frac{3}{2}$, meaning by this that $(\frac{7}{5})^3 < 3 < (\frac{3}{2})^3$.

In this sense we may say that the new numbers always lie *between*

two old numbers whose difference may be made as small as we please. Numbers possessing this property are called *irrational* numbers, in contradistinction to the numbers hitherto defined, which are termed *rational.* The considerations which before led us to negative rational numbers, now also lead us to negative irrational numbers. The repeated application of addition and multiplication as of their inverse processes to irrational numbers, (numbers which though not exactly equal to previously defined rational numbers may yet be brought as near to them as we please,) again simply leads to numbers of the same class.

A totally new domain of numbers is reached, however, when we attempt to impart meaning to *the square roots of negative numbers.* The square root of minus 9 is neither equal to plus 3 nor to minus 3, since each multiplied by itself gives plus 9, nor is it equal to any other number hitherto defined. Accordingly, the square root of minus 9 is a new number-form, to which, harmoniously with the principle of no exception, we may give the definition that $(\sqrt[2]{-9})^2$ shall always be put equal to minus 9.* Keeping to this definition we see at once that $\sqrt{-a}$, where a is any positive rational or irrational number, is a symbol which can be put equal to the product of $\sqrt{+a}$ with $\sqrt{-1}$. In extending to these new numbers the rights of arithmetical citizenship, in calling them also "numbers," and so shaping their definition that we can reckon with them by the same rules as with already defined numbers, we obtain a fourth extension of the domain of numbers which has become of the greatest importance for the progress of all branches of mathematics. The newly defined numbers are called *imaginary,* in contradistinction to all heretofore defined, which are called *real.* Since all imaginary numbers can be represented as products of real numbers with the square root of minus one, it is convenient to introduce for this one imaginary number some concise symbol. This symbol is the first letter of the word imaginary, namely, i; so that we can always put for such an expression as $\sqrt{-9}$, $3.i$.

If we combine real and imaginary numbers by operations of the

* Henceforward we shall use the simpler sign $\sqrt{}$ for $\sqrt[2]{}$.

first and second degree, always supposing that we follow in our reckoning with imaginary numbers the same rules that we do in reckoning with real numbers, we always arrive again at real or imaginary numbers, excepting when we join together a real and an imaginary number by addition or its inverse operations. In this case *we reach the symbol* $a + i \,.\, b$, where a and b stand for real numbers. Agreeably to the principle of no exception we are permitted to reckon with $a + ib$ according to the same rules of computation as with symbols previously defined, if for the second power of i we always substitute minus 1.

In the numerical combination $a + ib$, which we also call number, we have found the most general numerical form to which the laws of arithmetic can lead, even though we wished to extend the limits of arithmetic still further. Of course, we must represent to ourselves here by a and b either zero or positive or negative rational or irrational numbers. If b is zero, $a + ib$ represents all real numbers; if a is zero, it stands for all purely imaginary numbers. This general number $a + ib$ is called a *complex number*, so that the complex number includes in itself as special cases all numbers heretofore defined. By the introduction of irrational, purely imaginary, and the still more general complex numbers, all combinations become invested with meaning which the operations of the third degree can produce. For example, the fifth root of 5 is an irrational number, the logarithm of 2 to the base 10 is an irrational number. The logarithm of minus 1 to the base 2 is a purely imaginary number; the fourth root of minus 1 is a complex number. Indeed, we may recognise, proceeding still further, *that every combination of two complex numbers, by means of any of the operations of the first, second, or third degree will lead in turn to a complex number*, that is to say, never furnishes occasion, by application of the principle of no exception, for inventing new forms of numbers.

A certain limit is thus reached in the construction of arithmetic. But such a limit was also twice previously reached. After the investigation of addition and its inverse operations, we reached no other numbers except zero and positive and negative whole numbers, and every combination of such numbers by operations of the

first degree led to no new numbers. After the investigation of multiplication and its inverse operations, the positive or negative fractional numbers and "infinitely great" were added, and again we could say that the combination of two already defined numbers by operations of the first and second degree in turn also always led to numbers already defined. Now we have reached a point at which we can say that the combination of two complex numbers by all operations of the first, second, and third degree must again always lead to complex numbers; only that now such a combination does not necessarily always lead to a single number, but may lead to many regularly arranged numbers. For example, the combination "logarithm of minus one to a positive base" furnishes a countless number of results which form an arithmetical series of purely imaginary numbers. *Still, in no case now do we arrive at new classes of numbers.* But just as before the ascent from multiplication to involution brought in its train the definition of new numbers, so it is also possible that *some new operation springing out of involution as involution sprang from multiplication might furnish the germ of other new numbers which are not reducible to* $a + ib$. As a matter of fact, mathematicians have asked themselves this question and investigated the direct operation of the fourth degree, together with its inverse processes. The result of their investigations was, that an operation which springs from involution as involution sprang from multiplication is incapable of performing any real mathematical service; the reason of which is, that in involution the laws of commutation and association do not hold. It also further appeared that the operations of the fourth degree could not give rise to new numbers. No more so can operations of still higher degrees. With respect to quaternions, which many might be disposed to regard as new numbers, it will be evident that though quaternions are valuable means of investigation in geometry and mechanics they are not numbers of arithmetic, because the rules of arithmetic are not unconditionally applicable to them.

The building up of arithmetic is thus completed. The extensions of the domain of number are ended. It only remains to be asked why the science of arithmetic appears in its structure so logi-

cal, natural, and unarbitrary; why zero, negative, and fractional numbers appear as much derived and as little original as irrational, imaginary, and complex numbers? We answer, wholly and alone in virtue of the logical application of the monistic principle of arithmetic, the principle of no exception.

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OUTLINES OF A HISTORY OF INDIAN PHILOSOPHY.

A DISTINCTIVE leaning to metaphysical speculation is noticeable among the Indians from the earliest times. Old hymns of the Ṛigveda, which in other aspects are still deeply rooted in the soil of polytheism, show already the inclination to comprehend multifarious phenomena as a unity, and may therefore be regarded as the first steps in the path which led the old Indian people to pantheism. Monotheistic ideas also occur in the later Vedic hymns, but are not developed with sufficient logic to displace the multiform world of gods from the consciousness of the people.

The properly philosophical hymns, of which there are few in the Ṛigveda, and not many more in the Atharvaveda, belong to the latest products of the Vedic poetry. They concern themselves with the problem of the origin of the world, and with the eternal principle that creates and maintains the world, in obscure phraseology, and in unclear, self-contradictory trains of thought, as might be expected of the early beginnings of speculation. The Yajurvedas, also, contain remarkable and highly fantastic cosmogonic legends, in which the world-creator produces things by the all-powerful sacrifice. It is worthy of notice that the ideas of these portions of the Veda are intimately related with those of the earlier Upanishads, in fact in many respects are identical; * their connexion is also further evinced by the fact that both in these Upanishads and in the cosmogonic hymns and legends of the Veda the subjects discussed make their

*Compare on this point Lucian Scherman, *Philosophische Hymnen aus der Rig- und Atharva-Veda-Sanhitâ verglichen mit den Philosophemen der älteren Upanishads*, Strassburg–London, 1887.

appearance absolutely without order. Still, the pre-Buddhistic Upanishads, and, in part, also their precursors, the Brâhmaṇas, which dealt essentially with ritualistic questions, and the more speculative Âraṇyakas, are of the greatest importance for our studies; for they represent a time (that extending from the eighth to the sixth century about) in which the ideas were developed that became determinative of the whole subsequent direction of Indian thought:* first and above all, the doctrine of the transmigration of souls, and the theory intimately connected therewith of the subsequent effects of actions (*karman*). The belief that every individual unceasingly moves forward after death towards new existences in which it will enjoy the fruits of formerly won merits, and will suffer the consequences of formerly committed wrongs—whether in the bodies of men, animals, or plants, or in heavens and hells—has dominated the Indian people from that early period down to the present day. The idea was never made the subject of philosophical demonstration, but was regarded as something self-evident, which, with the exception of the Chârvâkas, or Materialists, no philosophical school or religious sect of India ever doubted.

The origin of the Indian belief in metempsychosis is unfortunately still much shrouded in obscurity. In the old Vedic time a joyful view of life prevailed in India in which we discover no germs whatever of the conception which subsequently dominated and oppressed the thought of the whole nation; as yet the nation did not feel life as a burden but as the supreme good, and its eternal continuance after death was longed for as the reward of a pious life. In the place of this innocent joy of life suddenly enters, without noticeable evidences of transition, the conviction that the existence of the individual is a journey full of torments from death to death. It is natural enough, therefore, to suspect foreign influence in this sudden revolution of thought.

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*Compare A. E. Gough, *The Philosophy of the Upanishads and Ancient Metaphysics*, London, 1882. The singular unfavorable judgment of the whole philosophy of the Upanishads which Gough pronounces in the opening of his otherwise valuable book, may perhaps be explained by the morbid aversion to all things Indian, which difficult and absorbing work so very frequently produces in Europeans dwelling any length of time in India.

I do not believe that Voltaire's rationalistic explanation of the origin of the Indian doctrine of the transmigration of souls now counts any adherents in professional circles; but it is remarkable enough to merit a passing notice. According to the theory of the ingenious Frenchman the knowledge that the use of meat was upon the whole injurious to health in the climate of India was the ground of the prohibition to kill animals. This originally purely hygienic prescript was clothed in religious trappings and the people thus gradually grew accustomed to reverence and to worship animals. The consequence of the further extension of this animal cult then was, that the whole animal kingdom was felt as a sort of appurtenance to the human species and was gradually assimilated to man in the imagination of the people; from there it was simply a step to accept the continuance of human life in the bodies of animals. This whole hypothesis has long since been rejected, and also several subsequent attempts at explanation must be regarded as unsuccessful.

A suggestion of Gough ("The Philosophy of the Upanishads," pp. 24–25) alone demands more serious consideration. It is well known that the belief that the human soul passes after death into the trunks of trees and the bodies of animals is extremely widespread among half-savage tribes.* On the basis of this fact, Gough assumes that the Aryans, on their amalgamation with the original indigenous inhabitants of India, received from these the idea of the continuance of life in animals and trees. Although this assumption can never be made the subject of proof,† the idea, in my opinion, is

* "The Sonthals are said to believe the souls of the good to enter into fruit-bearing trees. The Powhattans believed the souls of their chiefs to pass into particular wood-birds, which they therefore spared. The Tlascalâns of Mexico thought that the souls of their nobles migrated after death into beautiful singing-birds, and the spirits of plebeians into beetles, weasels, and other insignificant creatures. The Zulus of South Africa are said to believe the passage of the dead into snakes, or into wasps and lizards. The Dayaks of Borneo imagine themselves to find the souls of the dead, damp and bloodlike, in the trunks of trees." Gough, following Tylor, *Primitive Culture*, Vol. II, p. 6 et seq.

† One noteworthy passage bearing on this point may be found in Baudhâyana's Dharmaçâstra II. 8. 14. 9, 10, where it is prescribed that dumplings of flour should be thrown to the birds, just as they are offered in the usual ancestral sacrifices, "for it is said that our ancestors hover about in the shape of birds."

very probable, because it explains what no other combinations do sufficiently explain. But we must be on our guard lest we overrate the influence of the crude conceptions of the aborigines. With all tribes low in the scale of civilisation the idea implied in such beliefs is not that of a transmigration of souls in the Indian sense, but simply the notion of a continuance of human existence in animals and trees; with this, reflexion on the subject reaches its goal; further consequences are not drawn from the idea. Under all circumstances, therefore, the Aryan Indians can have received only the first impetus to the development of the theory of transmigration from the aboriginal inhabitants; the elaboration of the idea they borrowed—the assumption of a *constant, changing* continuance of life, and its connexion with the doctrine of the power of deeds, having in view the satisfaction of the moral consciousness—must always be regarded as their own peculiar achievement. The dominating idea of this doctrine is the firm conviction that *unmerited* misfortune can befall no one. On the ground of this conviction an explanation was sought for the fact of daily observation that the bad fare well, and the good fare ill; that animals, and often even the new-born child, who have had no opportunity to incur guilt, must suffer the greatest agonies; and no other explanation was found than the assumption that in this life are expiated the good and bad deeds of a former existence. But what held true of that existence must also have held true of the one which preceded it; again the reason of formerly experienced happiness and misery could only be found in a preceding life. And thus there was no limit whatever to the existence of the individual in the past. The Saṃsâra, the cycle of life, has, therefore, no beginning; for "the work (that is, the conduct or actions) of beings is beginningless." But what has no beginning has by a universally admitted law also no end. The Saṃsâra, therefore, never ceases, no more than it never began. When the individual receives the rewards for his good and his bad deeds, a residuum of merit and guilt is always left which is not consumed and which demands its recompense or its punishment, and, therefore, still acts as the germ of a new existence. Unexpiated or unrewarded no deed remains; for "as among a thousand cows a calf finds its mother, so the previously

done deed follows after the doer," says the Mahâbhârata, giving in words the view which had long since become in India the universal belief. Now, as the cause of all action is desire, desire was declared to be the motive power of the eternal continuance of life. Again, as desire was conceived by the Indian mind to have its root in a sort of ignorance, in a mistaking of the true nature and value of things, in ignorance, it was thought, the last cause of Saṃsâra was hidden. Equally as old is the conviction that the law which fetters living beings to the existence of the world *can* be broken. There is salvation from the Saṃsâra; and the means thereto is the saving knowledge, which is found by every philosophical school of India in some special form of cognition.

The dogmas here developed are summarised by Deussen, "System des Vedânta," pp. 381–382, in the following appropriate words: "The idea is this, that life, in quality as well as in quantity, is the precisely meted, absolutely appropriate expiation of the deeds of the previous existence. This expiation is accomplished by *bhoktṛitvam* and *kartṛitvam* (enjoying and acting), where the latter again is converted into works which must be expiated afresh in a subsequent existence, so that the clock-work of atonement in running down always winds itself up again; and this unto all eternity —unless the universal knowledge appears which . . . . does not rest on merit but breaks into life without connexion with it, to dissolve it in its innermost elements, to burn up the seeds of works, and thus to make impossible for all future time a continuance of the transmigration."

What Deussen here expounds as a doctrine of the Vedânta system is a body of ideas which belongs alike to all systems of Brahman philosophy and to Buddhism and Jinism. But the power which inheres in the actions of beings extends, according to the Indian idea, still farther than was stated in the preceding exposition. This subsequent effectiveness of guilt and of merit, usually called *adṛishṭa* "the invisible," also often simply *karman*, "deed, work," not only determines the measure of happiness and suffering which falls to the lot of each individual, but also determines the origin and evolution of all things in the universe. At bottom this last thought is only a

necessary consequence of the theory that every being is the architect of its own fate and fortunes into the minutest details; for whatever comes to pass in the world, some creature is inevitably affected by it, and must, therefore, by the law of atonement have brought about the event by his previous acts. The operations of nature, therefore, are the effects of the good and bad actions of living beings. When trees bear fruits, or the grain of the fields ripens, the power which is the cause of this, according to the Indian, is human merit.

Even in the systems which accept a God, the sole office of the Deity is to guide the world and the fates of creatures in strict agreement with the law of retribution, which even he cannot break. For the many powers to which the rest of the world, orthodox and unorthodox, ascribe a determinative influence on the lot of individuals and nations as also on the control of the forces of nature,—divine grace and punishment, the order of the world, foresight, fate, accident,—in India there is no place by the side of the power of the work or deed which rules all with iron necessity. On these assumptions all Indian philosophy, with the exception of materialism, is founded.

The most important theme of the early Upanishads, which stand at the head of the real philosophical literature of India, is, as we know, the question of the Eternally-One. The treatment of this question forces all other considerations into the background and culminates in the principle that the Âtman, the innermost self, the soul of the individual is one with the Brahman, the eternal, infinite power which is the ground of all existence. In opposition to this idealistic monism of the Upanishads, Kapila founded the oldest real philosophical system of India in the atheistic Sâṃkhya philosophy, which bears a strictly dualistic character and sees in the knowledge of the absolute difference between mind and matter the only means of attaining the highest salvation, that is, the eternal rest of consciousless existence. The contents of this system have already been sketched in the current volume of *The Monist*, page 177; an exhaustive exposition of its principles is given by the author in his work on the "Sâṃkhya Philosophy," Leipsic, H. Haessel.

In all main outlines the Sâṃkhya system supplied the founda-

tions of Buddhism and Jinism, two philosophically embellished religions, which start from the idea that this life is nothing but suffering, and always revert to that thought. According to them, the cause of suffering is the desire to live and to enjoy the delights of the world, and in the last instance the "ignorance" from which this desire proceeds; the means of the abolition of this ignorance, and therewith of suffering, is the annihilation of that desire, renunciation of the world, and a most boundless exercise of practical love towards all creatures. In the subsequent time, it is true, Buddhism and Jinism so developed that some of their teachings were stoutly contested in the Sâṃkhya writings.* These two pessimistic religions are so extraordinarily alike, that the Jaina, that is, the adherents of Jina, were for a long time regarded as a Buddhistic sect, until it was discovered that the founders of the two religions were contemporaries, who in turn are simply to be regarded as the most eminent of the numerous teachers who in the sixth century before Christ in North Central India opposed the ceremonial doctrines and the caste-system of the Brahmans. The true significance of these religions lies in their high development of ethics, which in the scholastic Indian philosophy was almost wholly neglected. Buddhism and Jinism agree, however, with the latter, in the promise, made by all real systems of India, to redeem man from the torments of continued mundane life, and in their perception of a definite ignorance as the root of all mundane evil; but in the philosophical establishment of their principles, both method and clearness of thought are wanting.†

It must also be mentioned in this connexion that the religions

*One question here was of the doctrine of the Jaina, that the soul has the same extension as the body—a thought which is refuted by the argument that everything bounded is perishable, and that this would hold good with all the more force of the soul, as this in its transmigration through different bodies must be assimilated to the bodies that receive it, that is, must expand and contract, a feat achievable only by a thing made up of parts. But the main points attacked are the following views of Buddhism. The Sâṃkhyas principally impugn the Buddhistic denial of the soul as a compact, persistent principle, further the doctrine that all things possess only a momentary existence, and that salvation is the annihilation of self. From this it is plain, that the Sâṃkhyas of the later epoch saw in Buddhism, which nevertheless was essentially an outgrowth of its system, one of its principal opponents.

‡ Compare especially the Buddhistic formula of the causal nexus in Oldenberg's *Buddha*, Part II, Chapter 2.

of Buddha and Jina have as little broken with the mythological views of the people as the Brahmanic philosophical systems. The existence of gods, demigods, and demons is not doubted, but is of little importance. It is true, the gods are more highly organised and more fortunate beings than men, but like these they also stand within the Saṃsâra, and if they do not acquire the saving knowledge and thus withdraw from mundane existence, must also change their bodies as soon as the power of their formerly won merit is exhausted. They, too, have not escaped the power of death, and they therefore stand lower than the man who has attained the highest goal.* Much easier than the attainment of this goal is it to lift oneself by virtue and good works to the divine plane, and to be born again after death on the moon or in the world of Indra or of Brahman, etc., even in the person of one of these gods; but only foolish men yearn after such transitory happiness.

In the second century before Christ the Yoga philosophy was founded by Patañjali. In part, this event is simply the literary fixation of the views which were held on asceticism and on the mysterious powers which it was assumed could be acquired by asceticism. The Yoga, that is, the turning away of the senses from the external world, and the concentration of the mind within, was known and practised many centuries previously in India. In the Buddhistic communion, for example, the state of ecstatic abstraction was always a highly esteemed condition. Patañjali, now, elaborated the doctrine of concentration into a system and described at length the means of attaining that condition, and of carrying it to its highest pitch. The methodical performance of the Yoga practice, according to Patañjali, leads not only to the possession of the supernatural powers, but is also the most effective means of attaining the saving knowledge.

The metaphysical basis of the Yoga system is the Sâṃkhya philosophy, whose doctrines Patañjali so completely incorporated into his system that that philosophy is with justice uniformly regarded

* This belief in developed, ephemeral gods has nothing to do with the question of the eternal God accepted in some systems. The use of a special word (*îçvara*, "the powerful") in the Indian philosophy plainly grew out of the endeavor to distinguish verbally between *this* god and the popular gods (*deva*).

in Indian literature as a branch of the Sâṃkhya. At bottom, all that Patañjali did was to embellish the Sâṃkhya system with the Yoga practice, the mysterious powers, and the personal god; his chief aim had, no doubt, been to render this system acceptable to his fellow-countrymen by the eradication of its atheism. But the insertion of the personal god, which subsequently decisively determined the character of the Yoga system, was, to judge from the Yogasûtras, the text-book of Patañjali, at first accomplished in a very loose and superficial manner, so that the contents and purpose of the system were not at all affected by it. We can even say that the Yogasûtras I. 23–27, II. 1, 45, which treat of the person of God, are unconnected with the other parts of the text-book, nay, even contradict the foundations of the system. The ultimate goal of human aspiration according to that text-book is not union with or absorption in God, but exactly what it is in the Sâṃkhya philosophy, the absolute isolation (*kaivalya*) of the soul from matter. When L. von Schroeder ("Indiens Literatur und Kultur," p. 687) says: "The Yoga bears throughout a theistic character; it assumes a primitive soul from which the individual souls proceed," his statement is incorrect, for the individual souls are just as much beginningless as the "special soul" (*purusha-viçesha*, Yogasûtra, I. 24) that is called God.

In contrast to these two closely related systems, Sâṃkhya and Yoga, the ancient, genuine Brahmanic elements, the ritual and the idealistic speculation of the Upanishads, are developed in a methodical manner in the two following intimately connected systems whose origin we can place approximately at the beginning of the Christian era.

The Pûrva-(or Karma-)mîmâṃsâ, "the first inquiry," or "the inquiry concerning works," usually briefly called Mîmâṃsâ, founded by Jaimini, is probably counted among the philosophical systems only because of its form and its connexion with the Vedânta doctrine; for it is concerned with the interpretation of the Veda, which it holds to be uncreated and existent from all eternity: classifying its component parts, and treating of the rules for the performance of the ceremonies, as of the rewards which singly follow upon the

latter. This last is the main theme of this system, in which the true scriptural scholarship of the Brahmans is condensed. Questions of general significance are only incidentally discussed in the Mîmâṃsâ. Especial prominence belongs here to the proposition that the articulate sounds are eternal, and to the theory based upon it, that the connexion of a word with its significance is independent of human agreement, and, consequently, that the significance of a word is inherent in the word itself, by nature. Hitherto, the Mîmâṃsâ has little occupied the attention of European indologists; the best description of its principal contents will be found in the "Introductory Remarks" of G. Thibaut's edition of the Arthasaṃgraha (Benares Sanskrit Series, 1882).

The Uttara-(or Brahma-)mîmâṃsâ, "the second inquiry," or "the inquiry into the Brahman," most commonly called Vedânta, bears some such relation to the earlier Upanishads as, to use an expression of Deussen's, Christian dogmatics bear to the New Testament. Its founder, Bâdarâyaṇa, accepted and further developed the above-discussed doctrines of the Brahman-Âtman, into the system which to the present day determines the world-view of the Indian thinkers. This system has received excellent and exhaustive treatment in the above-cited work of Deussen, which is to be emphatically recommended to all interested in Indian philosophy. The basis of the Vedânta is the principle of the identity of our Self with the Brahman. Since, now, the eternal, infinite Brahman is not made up of parts, and cannot be subject to change, consequently our self is not a part or emanation of it, but is the whole, indivisible Brahman. Other being besides this there is not, and, accordingly, the contents of the Vedânta system are comprehended in the expression *advaita vâda*, "the doctrine of non-duality." The objection which experience and the traditional belief in the transmigration of souls and in retribution raise against this principle, has no weight with Bâdarâyaṇa; experience and the doctrine of retribution are explained by the ignorance (*avidyâ*), inborn in man, which prevents the soul from discriminating between itself, its body and organs, and from recognising the empirical world as an illusion (*mâyâ*). The Vedânta philosophy does not inquire into the reason

and origin of this ignorance; it simply teaches us that it exists and that it is annihilated by knowledge (*vidyâ*), that is, by the universal knowledge which grasps the illusory nature of all that is not soul, and the absolute identity of the soul with the Brahman. With this knowledge, the conditions of the continuance of the mundane existence of the soul are removed—for this in truth is only semblance and illusion—and salvation is attained.

In this way are the Brahmasûtras, the text-book of Bâdarâyaṇa, expounded by the famous exegetist Çaṃkara (towards 800 after Christ) upon whose commentary Deussen's exposition is based. Now, as this text-book, like the chief works of the other schools, is clothed in the form of aphorisms not intelligible *per se*, we are unable to prove from its simple verbal tenor that Çaṃkara was always right in his exegesis; but intrinsic reasons render it in the highest degree probable that the expositions of Çaṃkara agree in all essential points with the system which was laid down in the Brahmasûtras. The subsequent periods produced a long succession of other commentaries on the Brahmasûtras, which in part give expression to the religio-philosophical point of view of definite sects. The most important of these commentaries is that of Râmânuja, which dates from the first half of the twelfth century. Râmânuja belonged to one of the oldest sects of India, the Bhâgavatas or Pâñcharâtras, who professed an originally un-Brahmanic, popular monotheism, and saw salvation solely in the love of God (*bhakti*). Upon the Brahmanisation of this sect, their God (usually called Bhagavant or Vâsudeva) was identified with Vishṇu, and from that time on the Bhâgavatas are considered as a Vishṇuitic sect. Its doctrine, which is closely related to Christian ideas, but, in my opinion, was not constructed under Christian influences, is chiefly expounded in the Bhagavadgîtâ, in the Çâṇḍilyasûtras, in the Bhâgavata Purâṇa, and in the text-books proper of the sect, among which we may also reckon Râmânuja's commentary on the Brahmasûtras. According to the tenet of the Bhâgavatas, the individual souls are not identical with the highest soul or God, and are also not implicated by a kind of "ignorance" in mundane existence, but by unbelief. Devout love of God is the means of salvation, that is, of union with the Highest.

The best exposition of the system which Râmânuja imported into the Brahmasûtras will be found in R. G. Bhandarkar's "Report on the Search for Sanskrit Manuscripts during the Year 1883–1884," Bombay, 1887, p. 68 et seq.

As of the systems thus far considered always two are found intimately connected, the Sâṃkhya-Yoga on the one hand, and the Mîmâṃsâ-Vedânta on the other, so also in a subsequent period the two remaining systems which passed as orthodox, the Vaiçeshika and the Nyâya, were amalgamated. The reason of this was manifestly the circumstance that both inculcated the origin of the world from atoms and were signalised by a sharp classification of ideas; yet the Vaiçeshika system is certainly of much greater antiquity than the Nyâya. The former is already attacked in the Brahmasûtras II. 2. 12–17, where at the conclusion the interesting remark is found that it is unworthy of consideration because no one embraced it. But in a subsequent period the system, far from being despised, became very popular.

Kaṇâda (Kaṇabhuj or Kaṇabhaksha) is considered the founder of the Vaiçeshika system; but this name, which signifies etymologically "atom-eater," appears to have been originally a nickname suggested by the character of the system; but which ultimately supplanted the true name of the founder.

The strength of the system is contained in its enunciation of the categories, under which, as Kaṇâda thought, everything that existed might be subsumed: substance, quality, motion (or action), generality, particularity, and inherence. These notions are very sharply defined and broken up into subdivisions. Of especial interest to us is the category of inherence or inseparability (*samavâya*). This relation, which is rigorously distinguished from accidental, soluble connexion (*saṃyoga*), exists between the thing and its properties, between the whole and its parts, between motion and the object in motion, between species and genus.

Later adherents of the Vaiçeshika system added to the six categories a seventh, which has exercised a momentous influence on the development of logical inquiries: non-existence (*abhâva*). With Indian subtlety this category also is divided into subspecies, namely,

into prior and posterior, mutual and absolute non-existence. Putting it positively, we should say, instead of "prior non-existence," "future existence," instead of "posterior non-existence," "past existence." "Mutual" or "reciprocal non-existence" is that relation which obtains between two non-identical things, (for example, the fact that a jug is not a cloth and *vice versa*); "absolute non-existence" is illustrated by the example of the impossibility of fire in water.

Now Kaṇâda by no means limited himself to the enunciation and specialisation of the categories. He takes pains, in his discussion of them, to solve the most various problems of existence and of thought, and thus to reach a comprehensive philosophical view of the world. The category substance, under which notion, according to him, earth, water, light, air, ether, time, space, soul, and the organ of thought fall, affords him the occasion of developing his theory of the origin of the world from atoms; the category quality, in which are embraced besides the properties of matter also the mental properties: cognition, joy, pain, desire, aversion, energy, merit, guilt, and disposition, leads him to the development of his psychology and to the exposition of his theory of the sources of knowledge.

The psychological side of this system is very remarkable and exhibits some analogies with the corresponding views of the Sâṃkhya philosophy. The soul, according to Kaṇâda, is beginningless, eternal, and all-pervading, that is, limited neither by time nor space. If, now, the soul could come into immediate connexion with the objects of knowledge, all objects would reach consciousness simultaneously. That this is not the case, Kaṇâda explains by the assumption of the organ of thought or inner sense (*manas*), with which the soul stands in the most intimate connexion. The soul knows by means of this *manas* alone, and it perceives through it not only the external things, but also its own qualities. The *manas*, as contradistinguished from the soul, is an *atom*, and as such only competent to comprehend one object in each given instant.

The last of the six Brahmanic systems, the Nyâya philosophy of Gotama, is a development and complement of the doctrines of Kaṇâda. Its special significance rests in its extraordinarily exhaus-

tive and acute exposition of formal logic, which has remained untouched in India down to the present day, and serves as the basis of all philosophical studies. The doctrine of the means of knowledge (perception, inference, analogy, and trustworthy evidence), of syllogisms, fallacies, and the like, is treated with the greatest fulness. The importance which is attributed to logic in the Nyâya system appears from the very first Sûtra of Gotama's text book in which sixteen logical notions are enumerated with the remark that the attainment of the highest salvation depends upon a correct knowledge of their nature. The psychology of the Nyâya agrees fully with that of the Vaiçeshika system. The metaphysical foundations, too, are the same here as in that system; in both, the world is conceived as an agglomeration of eternal, unalterable, and causeless atoms. The fundamental text-books of the two schools, the Vaiçeshika and Nyâya Sûtras, originally did not accept the existence of God; it was not till a subsequent period that the two systems changed to theism, although neither ever went so far as to assume a creator of matter. Their theology is first developed in Udayanâchârya's Kusumâñjali (towards 1300 after Christ), as also in the works which treat jointly of the Nyâya and Vaiçeshika doctrines. According to them, God is a special soul, like all other individual and similarly eternal souls, only with the difference that to him those qualities are wanting that condition the transmigration of the other souls, or that are conditioned by that transmigration (merit, guilt, aversion, joy, pain), and that he alone possesses the special attributes of omnipotence and omniscience, by which he is made competent to be the guide and regulator of the universe.

In the first centuries after Christ an *eclectic* movement, which was chiefly occupied with the combination of the Sâṃkhya, Yoga, and Vedânta theories, was started in India. The oldest literary production of this movement is the Çvetâçvatara Upanishad, composed by a Çivite, the supreme being in this Upanishad being invested with the name of Çiva. More celebrated than this Upanishad is the Bhagavadgîtâ, admired equally in India and in the Occident for its loftiness of thought and expression—an episode of the Mahâbhârata. In the Bhagavadgîtâ, the supreme being appears incarnated in the

person of Kṛishṇa, who stands at the side of the famous bowman, Arjuna, as his charioteer, expounding to this personage shortly before the beginning of a battle his doctrines. Nowhere in the philosophical and religious literature of India are the behests of duty so beautifully and strongly emphasised as here. Ever and anon does Kṛishṇa revert to the doctrine, that for every man, no matter to what caste he may belong, the zealous performance of his duty and the discharge of his obligations is his most important work.

The six systems Mîmâṃsâ, Vedânta, Sâṃkhya, Yoga, Vaiçeshika, and Nyâya, are accepted as orthodox (*âstika*) by the Brahmans; but the reader will notice, that in India this term has a different significance from what it has with us. In that country, not only has *the most absolute freedom of thought* always prevailed, but also philosophical speculation, even in its boldest forms, has placed itself in accord with the popular religion to an extent never again realised on earth between these two hostile powers. One concession only the Brahman caste demanded; the recognition of its class-prerogatives and of the infallibility of the Veda. Whoever agreed to this passed as orthodox, and by having done so assured for his teachings much greater success than if he had openly proclaimed himself a heretic (*nâstika*) by a refusal of such recognition. The concession demanded by the Brahmans, so far as it referred to Scripture, needed only be a nominal one; it compelled neither full agreement with the doctrines of the Veda, nor the confession of any belief in the existence of God.

By the side of the Brahmanic and non-Brahmanic systems mentioned in this survey, we find also in India that view of the world which is "as old as philosophy itself, but not older": * materialism. The Sanskrit word for "materialism" is *lokâyata* ("directed to the world of sense"), and the materialists are called *lokâyatika* or *laukâyatika*, but are usually named, after the founder of their theory, Châr vâkas. Several vestiges show, that even in pre Buddhistic India, proclaimers of purely materialistic doctrines appeared; and there is no doubt that those doctrines had ever afterwards, as they

* The first words of Lange's *History of Materialism*.

have to-day, numerous secret followers. Although one source (Bhâskarâchârya on the Brahmasûtra III. 3. 53) attests the *quondam* existence of a text-book of materialism, the Sûtras of Bṛihaspati (the mythical founder), yet in all India materialism found no other literary expression. We are referred, therefore, for an understanding of that philosophy, principally to the polemics which were directed against it in the text-books of the other philosophical schools, and to the first chapter of the Sarva-darçana-saṃgraha, a compendium of all philosophical systems, compiled in the fourteenth century by the well-known Vedântic teacher Mâdhavâchârya (translated into English by Cowell and Gough, London, 1882), in which the system is expounded. Mâdhavâchârya begins his exposition with an expression of regret that the majority of mankind espouse the materialism represented by Chârvâka.

Another Vedântic teacher, Sadânanda, speaks in his Vedântasâra, §§ 148–151, of four materialistic schools, which are distinguished from one another by their conception of the soul; according to the first, the soul is identical with the gross body, according to the second, with the senses, according to the third, with the breath, and according to the fourth, with the organ of thought or the internal sense (*manas*). No difference in point of principle exists between these four views; for the senses, the breath, and the internal organ are really only attributes or parts of the body. Different phases of Indian materialism are, accordingly, not to be thought of.

The Chârvâkas admit perception only as a means of knowledge, and reject inference. As the sole reality they consider the four elements; that is, matter. When through the combination of the elements, the body is formed, then by their doctrine the soul also is created exactly as is the power of intoxication from the mixture of certain ingredients. With the annihilation of the body, the soul also is annihilated. The soul, accordingly, is nothing but the body with the attribute of intelligence, since soul different from the body cannot be established by sense-perception. Naturally, all other supra-sensual things also are denied, and in part treated with irony. Hell is earthly pain produced by earthly causes. The highest being is the king of the land, whose existence is proved by the perception

of the whole world; salvation is the dissolution of the body. The after effects of merit and of guilt, which by the belief of all other schools determine the fate of every individual in its minutest details, do not exist for the Chârvâka, because this idea is reached only by inference. To the animadversion of an orthodox philosopher that the varied phenomena of this world have no cause for him who denies this all-powerful factor, the Chârvâka retorts, that the true nature of things is the cause from which the phenomena proceed.

The practical side of this system is eudæmonism of the crudest sort; for sensuous delight is set up as the only good worth striving for. The objection that sensuous pleasures cannot be the highest goal of man because a certain measure of pain is always mingled with them, is repudiated with the remark that it is the business of our intelligence to enjoy pleasures in the purest form possible, and to withdraw ourselves as much as possible from the pain inseparably connected with them. The man who wishes fish takes their scales and bones into the bargain, and he who wishes rice takes its stalks. It is absurd, therefore, for fear of pain, to give up pleasure, which we instinctively feel appeals to our nature.

The Vedas are stigmatised as the gossip of knaves, infected with the three faults of falsehood, self-contradiction, and useless tautology, and the advocates of Vedic science are denounced as cheats whose doctrines annul one another. For the Chârvâkas, the Brahmanic ritual is a swindle, and the costly and laborious sacrifices serve only the purpose of procuring for the rogues who perform them a subsistence. "If an animal sacrificed gets into heaven, why does not the sacrificer rather slay his own father?" No wonder that for the orthodox Indian the doctrine of the Chârvâkas is the worst of all heresies. The text-books of the orthodox schools seek, as was said above, to refute this dangerous materialism. As an example, we may cite the refutation of the doctrine that there is no means of knowledge except perception, given in the Sâṃkhya-tattva-kaumudî, § 5, where we read: "When the materialist affirms that 'inference is "not a means of knowledge,' how is it that he can know that a man "is ignorant, or in doubt, or in error? For truly, ignorance, doubt, "and error cannot possibly be discovered in other men by sense-

"perception. Accordingly, even by the materialist, ignorance, etc., "in other men must be inferred from conduct and from speech, and, "therefore, inference recognised as a means of knowledge even "against the materialist's will."

Besides the systems here briefly reviewed, the above-mentioned Sarva-darçana-saṃgraha enumerates six more schools, which on account of their subordinate importance and their not purely philosophical character may be passed over in this survey. There is question first of a Vishṇuitic sect founded by Ânandatîrtha (or Pûrṇaprajña), and secondly of four Çivite sects, the names of whose systems are Nakulîça-Pâçupata, Çaiva, Pratyabhijñâ, and Raseçvara. The doctrines of these five sects are strongly impregnated with Vedantic and Sâṃkhya tenets. The sixth system is that of Pâṇini, that is grammatical science, which is ranked in Mâdhava's Compendium among the philosophies, because the Indian grammarians accepted the dogma of the eternity of sound taught in the Mîmâṃsâ, and because they developed in a philosophical fashion a theory of the Yoga system, namely the theory of the Sphoṭa, or the indivisible, unitary factor latent in every word as the vehicle of its significance.

If we pass in review the plenitude of the attempts made in India to explain the enigmas of the world and of our existence, the Sâṃkhya philosophy claims our first and chief attention, because it alone attempts to solve its problems solely with the means of reason. The genuinely philosophical spirit in which its method is manipulated of rising from the known factors of experience to the unknown by the path of logical demonstration, thus to reach a knowledge of the final cause, is acknowledged with admiration by all inquirers who have seriously occupied themselves with this system. In Kapila's doctrine, for the first time in the history of the world, the complete independence and freedom of the human mind, its full confidence in its own powers were exhibited. Although John Davies (Sānkhya Kārikā, p. V) slightly exaggerates matters when he says "The system of Kapila . . . . contains nearly all that India has produced in the department of pure philosophy," yet Kapila's system may claim, more than any other product of the fertile Indian mind, the interest of

those contemporaries whose view of the world is founded on the results of modern physical science.

As for those who feel they are justified from a monistic point of view in looking down slightingly upon a dualistic conception of the world, the words of E. Röer in the Introduction of the Bhâshâpariccheda, p. XVI, may be quoted: "Though a higher development of philosophy may destroy the distinctions between "soul and matter, that is, may recognise matter, or what is perceived as matter, as the same with the soul (as for instance, Leibniz did), it is nevertheless certain, that no true knowledge of the "soul is possible, without first drawing a most decided line of demarcation between the phenomena of matter and of the soul." This sharp line of demarcation between the two domains was first drawn by Kapila. The knowledge of the difference between body and soul is one condition, as it is also an indispensable condition, of arriving at a true monism. Every view of the world which confounds this difference can supply at best a one-sided henism, be it a spiritualism or an equally one-sided materialism.

R. GARBE.

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LITERARY CORRESPONDENCE.

FRANCE.

M. Fr. Paulhan offers us in his new work, *Les caractères*, a study of concrete psychology, which he connects with the general system of psychology already known to your readers. Two classifications of characters have been recently proposed: one by M. Bernard Pérez,* in a work of which I have already spoken in this place; the other by M. Ribot in his course at the Collège de France (see the article in the *Revue philosophique* for November, 1892). M. Pérez establishes his types by the nature of the *movements* which in his judgment are the revelations of the character. Rapidity, slowness, and energy of movements give him *les vifs*, *les lents*, *les ardents*, or, as we might translate them, the *quick*, the *sluggish*, and the *ardent*, and by combination the *quick-ardent*, the *slow-ardent*, and the *balanced*. This, if I may be allowed the expression, is a classification of the ground-floor. That of M. Ribot is one of two or three stories. This author finds the dominant traits of character in *feeling* and *action*; these furnish him with three classes or generic types, the *sensitive* or emotional, the *active* or energetic, and the *apathetic*. Each one of these genera is in turn subdivided into specific types, based (I omit all details) on the variable proportions in which the intellect, taken for character of the second stage, is mingled with sensibility and activity. The last types, called *composite*

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* *Le caractère*. The fifth revised edition of M. Pérez's *Les trois premières années de l'enfant*, and the third edition of his *L'enfant de trois à sept ans*, have just been published by Alcan. These works have become classical.

and *partial*, represent, after a fashion, the crossings, and answer to the species. I may add that by relegation to a class of *armorphous*, or *unstable*, M. Ribot rejects in a lump a multitude of individuals possessed of no true character or personality.

With M. Paulhan the case is otherwise. The different categories of psychic types established by him are presented to us as the incarnations of abstract laws of general psychology, and it is here that we must seek "the examples of that grand universal law that brings to pass all that develops from plurality to unity, from incoherence to systematisation, and from chance to finality." If, then, character signifies, in the end, the system of association of the elements of personality, a classification of characters ought to reproduce the modes of the possible systems, the psychic compounds which are actually realised, and to follow up the varieties of combination, by proceeding from systems relatively broad to systems more restricted. The object of all classing is ultimately to reach the individual by gradually detaching it from less and less general groups. But what principle is to guide us in the hierarchic composition of our groups of character?

M. Paulhan indicates two classes of primary qualities capable of forming by their predominance psychological types. And these are the classes of qualities comprising (1) *forms* of mental activity, and (2) the concrete elements which *guide* that activity. We get, thus, first, (*A*), the types produced by the predominance of a particular form of mental activity, and here M. Paulhan considers the types proceeding (*a*) from different forms of psychological association, (*b*) from the different qualities of the tendencies and the mind; and, secondly, (*B*), the types formed by the predominance or the absence of a tendency, and here the author distinguishes the types determined, (*a*) by the vital tendencies, (*b*) by the social tendencies, and (*c*) by the supra-social tendencies. We obtain, thus, two degrees of determination. Nothing remains to be done except to connect the individual with one of the types of the first class, and to seek the modifications which he suffers in passing into the second. Two questions now arise. What are these directive principles worth, and what is the practical value of this classification?

The forms of general activity in which M. Paulhan finds his initial principle, call to mind the differential character which M. Pérez has given in citing movements as the indexes of character and which M. Ribot sees in suffering and in action. As to the second principle of M. Paulhan, we do not have its equivalent in the system of M. Pérez, but in that of M. Ribot we meet with one at least of the invoked *tendencies*, I mean the *intellect*, and it is the combination of the "form" and of the "tendency" which gives us in the two classifications the determinations of the second degree.

Here, however, the difference is clearly seen. M. Ribot has simply accepted dominant and averred traits of character—sensibility, activity, and intelligence. M. Paulhan starts from a personal theory; he is guided by the idea of "abstract systematisations," realised in the individual. His point of view is of incontestable value, but it runs the risk of losing altogether the real unity of the ego in seeking to seize its diversity. Does not his classification, by its comminution of types, lose part of its practical value? I fear it does, and I observe here in fact numerous qualifications put under headings which do not express a mode of being or acting at all precise and limited.

But will it not necessarily complicate our classification to define unities so highly complex as social individuals? I do not think so, and, although it may appear at first sight contradictory, I think a classification should offer outlines of greater extent and simplicity according as its ultimate distinctions are more difficult of appreciation. The principal merit of M. Paulhan, in my opinion, therefore, is that of having marked out a plan of study. Yet these very reservations throw upon me the duty of a just laudation of the high qualities of his work, which is highly interesting and filled with fine and profound *aperçus*. In reading the works of an author like M. Paulhan one is always fully recompensed.

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M. Le Dr. Durand (De Gros), of whom I have recently spoken in this place, has just published a new work, *Le merveilleux scientifique*, where he takes up anew the question of hypnotism. We meet

in these pages with the vigor, sometimes rude, of the combatant of the first hour, with a carefulness of method and of generalisation which is too much lacking in our day. Perhaps he will be reproached with having slightly sacrificed experience to speculation. He expounds with lucidity in the historical part of his book the different methods of hypnotism and suggestion practised by Mesmer, Braid, Faria, and Grimes. Leaving with those to whom it is due the honor of the discoveries, he justly claims for himself the priority of the theoretical views since largely exploited by recent writers. What are they? I shall endeavor to answer the question in a few words.

The theory of M. Durand implies two fundamental hypotheses. The one is, that the passes of hypnotism, by the inertia of thought which they bring on, determine an afflux of "nervous force" to the brain, in consequence of which the subject is rendered fit to receive the action of suggestion. Now the condition of that afflux is beyond doubt to be sought in a different distribution of the supply of blood, and that condition at least is not absolutely unverifiable. In any case, the phrase "nervous force" does not, in my judgment, necessarily imply an ultra-physical meaning; and, whether in gravitation, affinity, electricity, or what not, the notion of force is always reduced to a notion of equilibrium between material particles. If, finally, as M. Durand is inclined to think, there exists some state of matter which we do not know of, the existence, even if verified, of that new state, is still insufficient to justify at the very outset the miracles of occultism and of telepathy. But I shall not enter into this debate, and shall not object in advance to the possible discoveries of to-morrow, since we are not at the end of our science.

The other hypothesis consists in regarding the nervous centres and ganglia as real souls or physiological individualities possessing sensibility, memory, consciousness, will. There has been a general disinclination to accept the "spinal" and "ganglionary" souls of M. Durand; but several authors, such as Mr. Myers and M. Pierre Janet, speak to us of a "subliminal consciousness" and of a "subconsciousness," which is almost the same thing. And on the other hand, authors who, like M. Beaunis, reduce the rôle of the "sub-

egos" to mechanisms do not, according to M. Durand, extricate themselves from the contradiction which consists in qualifying as *unconscious*, acts which are *intelligent*. They escape here, he says, by maintaining that automatic, mechanical acts arrive at the consciousness of special centres which preside over them, but never reach the synthetic consciousness of the principal ego. Further, it will be necessary to come to some understanding about the relations of these souls with the higher ego, about their physiological character, their anatomical positions—no slight matters! But the hypothesis is not arbitrary; it remains a positive hypothesis, and may be justified from the general point of view of evolution.

It would take up too much space to show how the author utilises these two principles. But I must state that he was one of the first to show a distinct intelligence of the problems which the stupendous rôle of automatism creates in our psychic life, under the different names of habitude, technical memory, and revived impression, dreams, unconscious cerebration, etc. We have, in fine, in his book a psychology and a philosophy. We will read with interest some pages of his last chapter on the evolution of the ideas of God and of the soul. He has reached a monistic theory alike opposed to materialistic monism and spiritualistic dualism. He does not assume that matter is of a different essence from spirit; it is naught but its objective manifestation. The prime mover of the universe is conscious force.

M. Durand is a pronounced adversary of positivism. Comte made the grave mistake, we must admit, of confounding totally different intellectual problems under the one ill-defined head of metaphysics, and the literal application of his method will lead to the restricting of science to the work of the ant. Still, attenuating circumstances can be pleaded for him, as for the school of Magendie. No synthesis is possible without preliminary analysis, and positivism has sought to bring us back to facts by a reaction against philosophical fantasies, and to shut off the easy flights of the mind through the fissures of mysticism. It is necessary to put men back into their proper times to judge of them justly. The fault of rigid disciples is that they forget that the master they restrict themselves

to paraphrasing would have taught quite different lessons if he had come into the world a half century later.

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M. Th. Flournoy, of Geneva, has just supplied us with an excellent contribution—the result of a joint inquiry with M. J. Claparède—to the study of the *Phénomènes de synopsie* (*colored audition*). The faculty, now apparently common, of connecting visual images (sometimes hallucinatory) with auditory perceptions, largely occupies at present the attention of psychologists. Galton, Binet, and some others, have furnished good observations. In Germany Professor Gruber has applied himself to this new study, to which he attaches an excessive importance, and from which he expects results which in my judgment will never be forthcoming. M. Flournoy is more reserved than Professor Gruber. As the explanatory principles of synæsthesia he invokes in default of better ones, affective association, habitual association, and privileged association. These principles certainly suffice to explain a number of facts. But I think that the majority of cases, at least, always point to an anomaly, a psychic trouble, unimpaired though the subject may be in other respects. In short, I recommend the book of M. Flournoy to the curious. It is written with spirit, sagacity, and good judgment.

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I have still to point out a book of M. Ch. Féré, *La famille névropathique*, a teratological theory of morbid heredity and disposition; the hereditary elements, says M. Féré, are disorders of nutrition in the embryonic period, troubles which bring in their train different effects according to the epoch at which they are produced. Finally, there have appeared translations from the German of Oldenberg's *Buddha*, and of Max Nordau's beautiful work *Degeneration*. This last work is of great value, and I should have gladly reproduced the praises which I bestowed upon it in the *Revue philosophique* if *The Monist* had not already announced it to its readers under its German title *Entartung*. It is very desirable for the good of French literature that foreigners should not add to the success of certain of our writers, with whose merits the press is surcharged.

The help which the so-called experimental or psychological novel renders to the true understanding of human nature is very feeble when we look over the real and serious contributions of works such as those I have just mentioned.*

LUCIEN ARRÉAT.

PARIS.

THE PARIS INTERNATIONAL BOOK-EXHIBITION.

Every summer, after the close of the *salon*, an exhibition of some sort is opened in the Palais de l'Industrie and continued till winter sets in. These exhibitions are generally of rather a trivial nature. The chief attraction for most of the visitors, especially during the summer months, is the band which plays twice a day in the large covered garden given up to the sculpture during the *salon*. But this year's exhibition promises to be a notable exception to the rule, for it is to be devoted to a large and complete display of everything connected with books.

The approaching "Exposition Internationale du Livre et des Industries du Papier," which begins this July and continues till December, will be held under the patronage of the Ministers of Industry, Public Instruction, Fine Arts, and Public Works, and under the immediate direction of the Paris Publishers' Club (Cercle de la Librairie). The committee of patrons includes the names of the leading French publishers, of several members of the Academy, of well-known journalists and men-of-letters, of the directors of three of the great public libraries and of members of both Houses of Parliament. The Director-General is M. Georges Sénéchal, an ex-officer of the French navy, who has had wide experience in exhibitions.

The exhibits will be divided into fourteen groups, subdivided into thirty-seven classes, and will embrace the whole circle of knowledge, industry, and science which enters into the production of books and its kindred branches, newspapers, periodicals, etc. Thus, Group I will have to do with everything out of which paper can be

*All published by F. Alcan.

made and, at the same time, will offer specimens of the cheapest and most costly papers,—hand-made, China, Japan, vellum and parchments. Group II is confined to the materials used in printing, Group III to the machinery, and Group IV to the products, such as playing-cards, postage-stamps, *exlibris*, and the finest kinds of lithography, etc. Photography forms Group V.

But the centre of interest of the exhibition will be found in Group VI devoted especially to books, where will be seen examples of every sort of volume issued from the French and many foreign presses. A fine series of maps will be hung about the walls and the whole science of bookmaking will be displayed and exemplified. The fact that M. Gruel, President of the Bookbinding Trade, whose contributions to the French book section at Chicago will be remembered by many of *The Monist's* readers, has lent his name to the enterprise, tells what may be expected in the department of bibliopegy. All fine art publications will be brought together under Group IX, while Group X—a retrospective exhibition—will contain many rare curiosities loaned by public and private collections, such as papyri, manuscript Bibles, autographs, ancient *exlibris*, etc., and specimens of old processes employed in the manufacturing of books.

Group XI will embrace the exhibits of societies, benevolent organisations and co-operative printing offices which are in any way connected with the book business. Everything pertaining to bookcases and libraries, even to their heating and lighting, will be grouped by itself—Group XII—while Groups XIII and XIV will be of a miscellaneous nature and will include writing-machines, pens, pencils, new inventions, etc.

There will be a double jury—the "section jury" and the "superior jury." Half of the members of the section jury will be chosen by the exhibitors themselves and half by the Commissioner-General. The superior jury will be made up of the officers of the section juries. These juries will award diplomas of honor and medals of gold, vermilion, silver, and bronze, honorable mentions and "diplomas of collaboration," the last to be given to the best workmen of the houses which exhibit.

The special commissioner for the American and English sec-

tions is M. Gaston Rebours, the representative in France of *Scribner's Magazine*. He has formed an American and an English committee in Paris. At the head of the latter stands the British Ambassador, while the United States Ambassador has accepted the presidency of the American committee, one of whose members is Mr. Henry Vignaud, First Secretary of the United States Embassy, and an ardent bibliophile as well as a laborious diplomat.

THEODORE STANTON.

PARIS.

JAPAN AND CHINA.

The Japanese monthly *Richgozasshi*, of January, 1893, contains an article by Professor Inowye in which he compares Sosi's philosophy with Christianity, Spencerianism, Confucianism, and German pessimism. As Professor Inowye's article is inaccessible to those not familiar with the Japanese language, we here present a résumé of Sosi's philosophy, which is too little known among Western scholars.*

Sosi was born in the country of So, China, 400 years B.C. He was known as an eloquent orator, energetic writer, and learned philosopher. He left his noble work entitled with his own name, and it is read by all scholars in the literary line and admired by modern philosophers. By virtue of his doctrine, which partly coincides with Buddha's "Nirvâna" and partly with Schopenhauer's pessimism, he duly belongs to the modern idealistic school.

Sosi was no less a great thinker than Plato or Socrates, who lived in the same age. If his doctrine could be carefully tested by

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*We present here a table of the names referred to in this article, in Japanese and Chinese, as the spoken sounds of the same literal characters differ in the two languages.

JAPANESE	CHINESE
Sôsi.	Chwang-Tsz
Sô	Sung
So	Sú
I, (Eh)	Wéi
Bokusui	P'oh-Shwui
Gi	Wéi
Kautaishi or Kantaishi	Kwan-T'ui-T'sz'
Densiho	T'ien-Tsz' Fang
Sika	Tsz'-Kwá
Shusi	Chú-Tsz'
Chôsôkôsi	Cháng-Sang-Kung-Tsz'
Kan-insi	Kwan Yin Tsz'
Rôsi	Lao-Tsz' or Lau-Tsze
Tôkakusi	Tau-Kwo-Tsz'
Keisi	K'ing-Tsz'
Ressi	Lieh-Tsz'

the Western philosophers, assuredly it would command their admiration and very likely give some light to philosophical controversies: it is for this purpose that I bring this doctrine before you.

Sosi was born of a very poor family and lived under a constant pressure of poverty, by which, however, he was never depressed. Numerous opportunities for high positions were uncared for; he had no regard for money. We are told that King I, of So, sent a magnificent present to Sosi and offered him the office of prime minister. Sosi answered the king's messenger thus: "The thousand pieces of gold is a good income; the position of prime minister is high and honorable; but dost thou not know the fate of the pig that is fattened for the feast? It is carefully fed, daintily dressed, and finally guided into the temple where it is to be sacrificed. At this time it might desire to be a common pig, but how can it escape? Go thou away promptly; I would rather stay in a lowly home and enjoy its poverty, than to be held in bondage by the king."

The king was still anxious to secure him and sent two high officers, and repeated his demand by saying: "Please come and take the government in your hands." Sosi, who was fishing in the river Bokusui, answered without giving them any sign of respect: "I have heard there was a strange turtle which lived three thousand years ago in thy country, the skeleton of which the king carefully wraps up and keeps in his palace. Would this turtle rather die to be thus glorified by the king, or would it live to crawl in a muddy pond?" Then the two officers said: "We should think that the turtle would rather like to live in the muddy pond." Sosi replied: "Go thou away; I also would rather live in the muddy pond."

Sosi, wearing old shoes and soiled clothing, met with the king of Gi, who, having sympathy for the philosopher in his poverty, said to him: "How depressed thou art!" Sosi answered: "I am poor, but not depressed. If one has moral principles, yet cannot practise them, then he would be depressed; those who have tattered clothes and old shoes may be poor, but not depressed."

From the foregoing stories we learn for what he cared and for what he did not. His indifference to fortune is due to his doctrine.

How was he educated? and whose doctrine did he fol-

low? are important questions; there are two traditions about his early education. According to Kantaisi, Sosi was taught by Densiho, whose name is given in Sosi's book. Densiho was taught by Sika, who was one of the principal disciples of Confucius, and in this respect Sosi may be called a follower of Confucius. But Shusi said Sosi was taught by Chosokosi, who was a pupil of Kan-insi, who was a disciple of Rosi;* therefore Sosi must be a follower of Rosi, the great rival philosopher of Confucius. By examining Sosi's doctrine we may judge that he belonged to Rosi's school rather than to Confucius's, yet it seems that he first studied the latter, then the former, and finally built up his own system, which in its ethical application coincides with that of Rosi.

Sosi's principle is based upon Rosi's, but he discusses the subject more freely than his predecessor. However, his discussion is rather conversational than argumentative; consequently, his noble phrases are disjointly placed, and the treatise, as a whole, sinks into confusion.

Sosi recognises two kinds of existence: the one is distinguishable, and the other undistinguishable; the one is relative and finite, and the other is absolute and infinite; the one is the world of dependence and mutual maintenance, the other is independent and self-existing; finally, the one is a false, temporal, and changing world, the other is a true, eternal, and fixed world.

All these notions are derived from the first couple of antitheses —distinguishable and undistinguishable. The same conclusion may be arrived at from a psychological point of view. Let me briefly discuss it.

When the state of things is distinguishable its various aspects reflect upon the mind and arouse the waves of thought, producing emotion, passion, and temptation. But where there is no distinction in the state of things, and all are equal like the perfect equilibrium of scales, there are no vibrations arising in our consciousness. The one is a state of perfect equilibrium, therefore its condition is

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* Rosi is the Japanese spoken sound of Lâo-tsze. See table on page 607, footnote.

fixed and peaceful; the other is out of balance, therefore its condition is changeable and struggling. Hence Sosi thought this real world not a very happy world. He said the distinguishable world is a temporary world of short lodging, and the undistinguishable world is the one which we should seek to attain.

Sosi derived this idea of two sorts of worlds from Rosi, who said in the first chapter of his book: "Non-name is the beginning of the world, and name is mother of the universe."

Here, by "non-name," Rosi means the undistinguishable world, and by "name" the distinguishable. Sosi divides Rosi's non name into two, in order to make a clear separation of the distinguishable from the undistinguishable, and said in the chapter of "Heaven and Earth": "There was in the beginning of the world nothing-nothing, then non-name, and then name." Here by "nothing-nothing" he does not mean the world was originated out of nothing, but that there was such a thing that could never have properly been termed anything else than "nothing-nothing," which, in his view, is still existing and forming the true world.* Here a question will naturally arise. If this real world of transiency was made from "nothing-nothing," why does it differ from the true world of "nothing-nothing"? This may be answered by saying, "nothing-nothing" is creative while the real world is created; being modified, it retains no longer the first quality. "Nothing-nothing" may contain Rosi's "non-name" and Ressi's "invisible," and it well coincides with Spencer's "Unknowable."

According to Spencer, "the Unknowable" is beyond reach of

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*The ideas "nothing" and "emptiness," as is well known, play an important part in Lâo-tsze's philosophy. The Chinese conception of nothing, however, is different from that which is common among the Western nations. Nothing, in Chinese philosophy, is the absence of distinguishing features and the presence of all that which permeates with equal reality all existence. It is comparable to Hegel's Absolute, who also puzzled the world with his famous dictum that absolute nothing and absolute being are identical. Now Sosi's term "nothing-nothing" must not be construed to mean a negation of nothing, so as to denote something that is "not nothing," but, according to the Chinese idiom, it conveys the idea of a higher kind of nothing; it is, as it were, and to use the mathematician's slang, 0^2, viz., nothing to the second power, and we might translate it by "absolute nothing."—Ed.

human knowledge, yet underlies everything. So it is with "nothing-nothing." It is beyond human reach yet we are originated out of it; and we cannot be independent of it but it includes us all; as it is infinite and we finite, we are simply its parts. This idea becomes clear when he claims his truth of "nothing-nothing" to be omnipresent. Tokakusi asked Sosi, "Where is the Truth?" Sosi said, "The Truth is in ants." Tokakusi, being surprised with the answer, repeated his question. Sosi said, "It is in wheat, in brick and in wall." Thus he evidently claims the truth of "nothing-nothing" to be in either organic or inorganic matter, and in every space and time. The universe, whether known or not, has a knowable character. We are like a frog in the bottom of a well, ignorant about the universe. But when we come up to the top we shall know more. Hence Sosi divided his distinguishable world or knowable universe into two, by calling them "name" and "non-name" according to whether they are conceived by human thought or not. Unknowable or undistinguishable is not that which is not known, but that which cannot be known. We may be with it when we reach that highest stage. To be with it is not to know it: to know it is to describe it relatively. But how can we speak relatively when there is nothing to compare?

Thus Sosi's classification was a great success; it made the distinction between knowable and unknowable very clear—the task in which Spencer failed utterly.

Sosi applied this same classification to humanity and said, "I have reached as high as "nothing" but not "nothing-nothing" yet. Thus the essence of Sosi's doctrine is "nothing-nothing" and he regards it as the highest stage which we must strive to attain.

"How can we attain this stage?" is the most important question on which his doctrine is based. Sosi answers this question with four words, *Kio mu ten tan*, which may be translated: "Sweep off all the impurity from thy heart, and store only the truth, which is 'nothing-nothing.' Therefore, in short, keep thy heart empty." To do this is to cast aside all worldly desire and to animate ourselves with the divine spirit. Is this not near the Christian teaching? Yet a spy of the enemy lies in the pleasing spot. Spirit is

immortal, yet life is mortal. Spiritual life must be distinguished from physical life. The first is not a continuation of the second. Spirit simply rests in a living body and it does not give life to dead matter. This distinction is not clear in Christianity, yet it is very clear in Sosi's doctrine. He said, "Life is combination or arrangement of elements; when the elements assemble, there is life; and when they scatter, there is death. Consequently the life is that which we borrow and is therefore the dust." In the chapter of "Absolute Happiness" of his book, he gives us an interesting story, relating to his own conduct, which may astonish my reader. Sosi lost his wife. His friend Keisi came to mourn her death, but seeing Sosi lying down and singing, he was quite surprised and blamed him: "Thy wife was a faithful companion; she nourished thy children, became aged and now is dead; but thou art not only indifferent to her death but lie here and sing. What is the matter? Is this conduct not abominable?" Sosi answered, "No, since I lost my wife why should I give utterance to my sorrow? Think of her origin; she had no life, no shape, no spirit, before she was born. Some things which were floating in infinite space were assembled, modified and formed elements: the elements modified and formed shape, and the shape modified and formed the living being of humanity. Now her body has taken a reverse order, modified itself and sunk into death. This is quite analogous with the passing of spring and autumn, winter and summer. O! my wife has gone into this 'Great Room,' the universe. If I cry and regret, I show my ignorance of 'Decree'; therefore, I do not cry." If he had been Schopenhauer he would very likely have requested congratulations upon her death, for, according to his pessimism, the birth of any one is to be regretted, because he must fall under the burden of bitterness of this melancholy world. Sosi did not go to such an extreme as Schopenhauer, but his dislike of the world was clear when he said: "The life-time in the world is not better than the time before his birth." Then he continues, "death is better than birth."

This idea may be illustrated by an interesting story told of him.

"Sosi went to So and saw a skull lying on the ground. He struck it and said: "Hast thou been covetous of life, but finally art

overcome by death? Hast thou been killed when thy country wast destroyed? Having committed some crime, hast thou killed thyself, fearing punishment and disgrace to thy family? Hast thou died from hunger or cold? Hast thou been wearied by thy great age?" Speaking thus, Sosi went to sleep, taking the skull as a pillow. At midnight Sosi dreamed of the skull who said to him: "All that thou hast suggested are distresses of mankind, but when one dies one has no trouble at all. Wouldst thou like to know what death is?" Sosi answered "Yes." The skull said: "If a man is dead he has no king, no subject, no change of climate, but freely floats in heaven; no king can enjoy such profound happiness." Sosi not without distrust asked the skull: "Wouldst thou like to be covered up with flesh and skin and sent back to thy home?" The skull clouded his brow, and said: "Why should I desire to leave this happiness and return to the world and resume human distress?"

Such being Sosi's doctrine, its essential point is to leave or forget this toilsome world and embody ourselves with "nothing-nothing." But such an effort and passive nature can never be expected of man. For this reason Sosi's doctrine could neither progress nor be practised. And this is the main difference between Sosi's doctrine and Confucianism.

KEIJIRO NAKAMURA.

JAPAN.

BOOK REVIEWS.

LOGIK. By *Dr. Christoph Sigwart*. Zweiter Band. Die Methodenlehre. Zweite durchgesehene und erweiterte Auflage. Freiburg i. B. and Leipsic: J. C. B. Mohr. 1893. Pp. 761. Price, 10 marks.

LOGIK. EINE UNTERSUCHUNG DER PRINCIPIEN DER ERKENNTNISS UND DER METHODEN WISSENSCHAFTLICHER FORSCHUNG. By *Wilhelm Wundt*. Erster Band. Erkenntnisslehre. Zweite umgearbeitete Auflage. Stuttgart: Ferdinand Enke. 1893. Pp. 651. Price, 14 marks.

"If one were to inspect," says Professor Adamson, "a fair proportion of the "more extensive recent works on logic, the conclusion drawn would be probably "the same,—that, while the matters treated show a slight similarity, no more than "would naturally result from the fact that thought is the subject analysed, the di- "versity in mode of treatment is so great that it would be impossible to select by "comparison and criticism a certain body of theorems and methods, and assign to "them the title of logic. . . . In tone, in method, in aim, in fundamental principles, "in extent of field, they diverge so widely as to appear, not so many different exposi- "tions of the same science, but so many different sciences. In short, looking to the "chaotic state of logical text-books at the present time, one would be inclined to say "that there does not exist anywhere a recognised, currently received body of specu- "lations to which the title logic can be unambiguously assigned, and that we must "therefore resign the hope of attaining by any empirical consideration of the re- "ceived doctrine a precise determination of the nature and limits of logical theory."

In its modern form as theory of knowledge and methodology, logic embraces parts of nearly every philosophical discipline. In each investigator's hands it has assumed a form which accords with the author's predilections, being predominantly metaphysical, epistemological, psychological, mathematical, or linguistic, according as the processes of thought, in the aspects in which they are treated, are deemed to be better typified or illustrated by the one or the other of these points of view. While some treatises have laid special stress upon only one of these sides of mental activity, others, in the aspiration to be a complete compendium of the science, have sought to do justice to all, so that most of the works of this latter class have become

rather epitomes of the results of the investigations of the special sciences than a study of the laws of thought and inquiry. Especially have these treatises neglected the discussion of the philosophical foundation of the laws of thought and inquiry, having restricted themselves almost exclusively to the exposition of the methods of science, as justified by results; although such a discussion is absolutely indispensable to the determination of the scope and character of logic.

Two noteworthy exceptions to this error are the works of Sigwart and Wundt, although each has accomplished its task in a different measure and in a different manner, showing differences of point of view and of scientific training. Sigwart's treatment of the fundamental philosophical question is predominantly formal and metaphysical; Wundt's predominantly psychological. This difference is also noticeable in the second volumes of their works, which treat of methodology, where the investigations of Wundt are richly embellished by illustrations from all the positive sciences, while Sigwart is very meagre in historical illustrations. Both agree in their independence of tradition.

Professor Sigwart, to take his book first, was one of the first laborers in the field of modern logic, and of all the larger treatises on the subject his is perhaps the most economically and concisely worked out. We do not meet in his work with résumés of the special sciences nor with profuse criticisms of opposed opinions, but have simply an exposition of methods in a clear and general form permeated by unity of treatment and distinguished by perspicuity. Still the work is large enough. It consists of two indexed volumes, containing respectively four hundred and eighty-five and seven hundred and seventy-eight pages, published in 1873 and 1878. The first volume of the present edition, reviewed in *The Open Court* of 1889, No. 107, appeared in 1888; the second in 1893. It was thus, we see, one of the first of that great series of works beginning with Trendelenburg, Ueberweg, and Mill whose object was to new-model logic, and to bring it into living relation with the scientific wants of the time. We shall review here Professor Sigwart's conception of the scope and purpose of logic and then present a résumé of his idea of methodology.

One of the chief and most imperative prerequisites of successful conduct in life is the possession of principles that are certain and universal. Hence the need of reflexion upon the conditions under which this object can be attained, and consequently of determining the rules by following which it can be attained. This is the problem of logic; if it were solved we should have *a true art of thought*.

The nature of thought is primarily a subject of psychology. But the foundations, here, are mooted questions. Language affords us the best foothold. In this, thought is essentially presentative activity: either involuntary, such as that which makes up the ordinary routine of life, or voluntary, willed, presentative activity, the purpose of which is the pursuit and satisfaction of the needs of life, in the widest sense of that expression. Here we are. We find ourselves surrounded by facts, circumstances, laws, with definite purposes to be realised. How are we to determine whether the thought which guides our conduct will, when executed, accomplish our

purposes? Solely by our awareness of the necessity of our thought, or in other words by its logical structure.

Necessity of thought here, is not to be interpreted as *psychological* necessity, but is to be conceived as a necessity which is rooted in the contents and object of thought itself, in the nature of the objects that are thought: this is what we mean when we speak of the objectivity of thought.

Again, in the connexion of logic with ontology, it is exactly the same attributes which express the object of thought when this serves the purpose of reaching a knowledge of existence. Here, too, the aim at which purposive thought strives must be stated as a consciousness of its necessity and universality. Ordinarily we assume the existence of an independent objective world by a kind of psychological constraint, the knowledge of which is the object of thought. But this conclusion is always found on analysis to be an act of inference resting in the necessity of our thought; outside of thought there is no means of knowing whether we have reached this object; agreement of thought with fact is therefore necessity of thought; and necessity of thought in all minds, with respect to the same object, is universal thought. If the possibility of a knowledge of the world as it is in itself be denied, if being is only one of the thoughts that we produce, the fact yet remains undisputed that we attribute objectivity to the ideas which we produce with the consciousness of necessity, and that as soon as we posit a thing as existing we declare by implication that all other thinking beings of the same nature must produce it with the same necessity. This means that if we produce only necessary and universal thought, the knowledge of existence is implied in that thought. This conception exhausts the nature of "truth." Whether we speak of mathematical, objective, or moral truths, the common character of that which we denominate is, that it is a necessary and universal product of thought. We thus avoid the difficulties involved in the assumption of any special theory of knowledge as a foundation of logic.

Now, all thought which seeks to become conscious of its necessity and universality is accomplished in judgments expressed as statements or sentences; judgments are the goal of all practical reflexion, of all knowledge, the final form of all conviction; all else are conditions and preliminaries of judgment. But error and contention show that our practical thought often fails of its purpose, the judgments in which it is stated being in part rejected by ourselves and in part by others. Hence the necessity of a discipline which will teach us how to avoid error and controversy, and to execute our operations of thought so that the judgments which proceed therefrom shall be true, that is, necessary and certain, and that is, again, accompanied by a consciousness of their necessity, and, therefore, universal. Here, the logical and psychological consideration of thought are distinguished. Psychology seeks to exhibit to us the natural history of thought; the opposition of true and false has no place in it. But logic presupposes the purposive thinking of truth. In this aim it sets up the criteria of the thinking of truth, and on the other hand supplies instructions for so conducting thought that the truth shall be reached.

Logic is thus in one aspect a critical discipline of completed thought, and in the other aspect an art of thought. But again, as all criticism is of value only in so far as it is a means to attain an end, the highest and most important task of logic, and that which constitutes its real nature is its office as an art.

With respect to the scope of logic it is to be stated that this science assures us only of the formal correctness of the processes of thought and not of their material truth. With respect to the postulate of logic, the possibility of setting up criteria and rules of necessary and universal mental progress, rests upon the ability of distinguishing objectively necessary thought from non-necessary thought, and this ability is manifested in the immediate consciousness of the evidence which accompanies necessary thought; the experience of this consciousness and the belief in its trustworthiness is a postulate behind which we cannot go. The criterion which distinguishes necessary and universal judgment from false individual judgment is in the end our subjective feeling of necessity, our consciousness that with the given assumptions we *cannot* think differently from what we do.

These considerations determine Professor Sigwart's method of treatment. First, the nature of the function must be investigated for which the rules are to be sought; secondly, the conditions and laws of its normal operation must be determined; and finally, the rules of procedure are to be discovered by means of which from the incomplete condition of natural thought on the basis of given assumptions and means the perfect condition can be reached. The investigation is, therefore, divided into an analytical part, a normative part, and a technical part. The first two parts make up Volume One. Volume Two, of considerably greater extent, constitutes the technical part, being methodology.

The office of methodology is to supply the directions according to which from a given state of mind and knowledge by the use of the mental powers at our control, the object can be fully reached which human thought has set itself, and when we say fully we mean, by fully determined concepts and fully established judgments. Absolute certitude of notions and conscious verification of judgments are the two essential features of the ideal condition at which our thought aims. The question, how this ideal state can be reached with the means at our command is the object of the doctrine of methods.

In the second, the normative part of the work, the necessity was emphasised of searching for the simple elements of concepts and of determining the forms of their synthesis, so that we could have the conviction that the simplest elements of concepts were thought by all in the same manner, and that they were competent to determine fully every object of thought by unequivocal mental attributes. In the second place, in laying the foundations of judgments, it was found necessary to have full consciousness of those judgments which carry their justification in themselves; which necessitated the search for axioms. Hence result the following two inquiries, as determinative of the form of methodology, namely: (1) the procedure by which it is possible so to fix the collective simple elements of all the contents of

the mind that we can be sure of their agreement in all thinking persons, and can determine the forms of their synthesis so that they can be combined in a concordant manner into composite concepts by all rational beings; (2) the procedure by which it is possible to acquire a clear consciousness of the ultimate assumptions of all judgment, upon which all justification of judgments not immediately evident depends, and by which we can establish the justification of every single judgment in a universally cogent manner.

More especially, the form of methodology is dependent on the nature of the conditions of fact in which the thought stands that it proposes to regulate, and on the other hand on the contents of the purpose which our purposive thought sets itself. This purpose is in part the knowledge of the world, as accessible to perception, and in part the establishment of the ultimate aims of practical volition. The ideal knowledge of the world involves a complete picture of the world in space and time, a classification of the facts of reality, an insight into the necessity of the facts of reality in the form of absolute causal connexion. Reflexion on the aims of practical volition finds its consummation in the setting up of a highest purpose which embraces all individual acts, and in the insight that that purpose must be unconditionally willed.

It will be readily seen that the inquiries set involve a consideration of the history of science, and as the first and most essential foundation the analysis of all our notions into the simplest elements, with their resultant manifold syntheses constructed according to fixed rigid rules. How these two principles lead to the examination of the fundamental notions of mathematics, psychology, etc., is evident, as is also the manner in which they must be grouped in such a consideration.

A very interesting addition to the second edition is a discussion of the notion of effect appended to the section of that name, treating of causality, where Wundt's notions of substantial and actual causality are very clearly criticised. A feature of the second part, also, is Sigwart's *special* discussion of the methodological premises of psychology.

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Coming to Wundt, some idea of this author's conception of the scope and purpose of logic will be given, as best characterising the work. Although we should not accept to-day, says Wundt, Kant's dictum of the stability of logic, nor ascribe any real value to the artifices of the scholastic syllogistics, much less regard thought as a simple mechanism of subsumption, it is yet customary with most authors, despite this belief, to start from the old traditions. By their adherence to these old forms, however, they unwittingly hamper themselves, for the Aristotelian logic, though it is useless as an organon of truth, is still not incorrect. Wundt, therefore, in his investigation begins anew and draws his material, not from tradition, but from the living testimonies of thought in language, and from those assured and successful methods of acquiring knowledge actually used in scientific research. Only in so

far as historical elucidation is necessary is the traditional side of logic regarded in his treatment.

Logic, according to Wundt, must give account of the laws of thought which are active in the quest of truth. Logic is made thus to assume a place between psychology, the general science of mind, and the remaining theoretical sciences. Psychology teaches us how the course of thought is actually accomplished; logic determines how the course of thought must be accomplished in order to lead to correct results. Whilst the individual sciences seek to ascertain the facts of their respective provinces, logic seeks out the universal rules for the methods of thought applied in those researches; it is thus a normative science. The problems of logic refer us back on the one hand to psychological inquiries, and on the other they carry us forward to the universal principles of knowledge and the modes of procedure of scientific inquiry. If the laws of logical thought are not to be accepted as inexplicable facts, their origin must be sought for in our subjective experience. Further, if these laws are to subserve the purposes of the quest of truth, the ground of their evidence must be examined and the conditions ascertained under which their application leads to actual knowledge. Finally, if logic is to assist the theoretical sciences, it must trace out the complicated forms which the logical laws take on in the actual methods of scientific research. Besides the expression of the logical norms Wundt, therefore, demands of scientific logic three things: a history of the psychological genesis of thought; an investigation of the foundations and conditions of knowledge; and an analysis of the logical methods of scientific research. To sum up, logic requires epistemology for its foundation and methodology for its completion.

After his short review of the forms which logic assumes in the hands of the great philosophers, which may be classified under the general heads of formal logic and metaphysical or dialectic logic, Wundt discusses the relations of logic to philosophy in somewhat the following terms. Formal logic is declared by its representatives to be the universal propædeutic of philosophy, and to be exempt from the dispute which hovers over all philosophical questions. But this advantage is obtained at the cost of its scientific character. Even if that were the main office of logic it would still fail of its purpose, for sceptics and dogmatists have frequently enough disputed the certainty of the logical norms as being simply empirical rules, and rationalists and empiricists have not infrequently accorded in the statement that those logical norms were worthless, as at best they simply taught how existing knowledge was to be ordered, and not how it was to be acquired. On the other hand, whilst formal logic placed itself outside of philosophy, the metaphysical logic pretended to be philosophy itself. It was an organon of thought in the fullest sense of the word, for its instrument created its subject-matter. By the principle of the identity of thought and being, logical thought developed by its own spontaneous movement the connexion of ideas: logic became metaphysics, which in its turn embraces all other philosophical disciplines as dependent provinces. Scientific

logic finally regards itself as a branch of philosophy, for philosophy seeks to resolve the problems which are common to the individual sciences. And these problems are of two kinds. They refer partly to the general content of knowledge, partly to its foundations and to the norms of its development. With the content of knowledge metaphysics busies itself. She expounds this content in general notions about being and in laws concerning its relations. Such notions and laws are, it is true, developed by the experimental sciences, and only subsequently handed over by them to philosophy, which subjects them to a final elaboration in order to bring the single facts and hypotheses in harmony with one another and with the general principles of cognition, and to complete them finally by means of further suppositions which are demanded by the connexion of the different provinces of experience. The aim of metaphysics, thus, is the creation of a consistent view of the world which will put all isolated knowledge into solid interconnexion.

As it is the office of metaphysics to present developed knowledge, so it is the office of logic to present developing knowledge, with the methods that lead to it and the means which human thought employs. The theory of knowledge might be given an independent middle place between logic and metaphysics as that discipline which is to investigate the content and not the methods of knowledge or its foundations and its limits. But with the establishment of this task the theory of knowledge is put into the most intimate relation with logic. For one of its principal tasks must be to examine with respect to their origin and certainty the logical norms and methods themselves. Logic, therefore, cannot dispense with the aid of epistemological inquiries. Similarly the fundamental notions and laws of scientific cognition stand in close relation to the general laws of thought, and here again the more complicated logical methods presuppose throughout principles which, like the notion of substance or the laws of causality, for example, are proper subjects of epistemological investigation. On these grounds it appears impracticable to separate from each other in an exposition of this subject the provinces of epistemology and scientific logic.

Assigning to logic, therefore, this more general significance, logic and metaphysics are the two halves of theoretic philosophy. But logic is that half which stands in more intimate relation with the single sciences. With metaphysics this relation is a one-sided one. She is compelled to learn from empirical research, whilst the latter in its collection of facts and in the development of provisional hypotheses need take no account of metaphysical requirements. With logic, on the other hand, the relation is throughout a reciprocal one. From the modes of mental procedure and of research as actually practised, logic abstracts its general results; afterwards, however, it hands over these general results to the individual sciences as binding norms, to which at the same time it adds rigorous conclusions with respect to the certainty and the limits of cognition which, if it neglect, special research will be easily led away from its assured foundations to end up in groundless doubts or in crude metaphysics.

With this the substance and the differences of the two systems are sufficiently emphasised, to admit of comparisons, which the reader may draw for himself.

T. J. McC.

THE PSYCHIC FACTORS OF CIVILISATION. By *Lester F. Ward.* Boston: Ginn & Co. 1893. Price, $2.00. Pages, 369.

This work is intended as a contribution to both psychology and sociology, and attempts to place "over against the purely physiological economy" a psychological economy. "For," says the author, "human society which is the highest product "of evolution, naturally depends upon mind which is the highest property of mat-"ter" (p. 3).

Mind is possessed of two sides, viz., of feelings and emotions, or the subjective side, and of the intellect, or the objective side. Thus the work naturally divides itself into three parts: (1) the subjective factors, (2) the objective factors, and (3) the social synthesis of the factors. The first part undertakes to show that the true forces of society are psychic; the second part explains the directive agent controlling the social forces, which is also psychic, being the objective side of mind or thought. The third part points out how the social forces, under the control of the directive agent, have established society.

This in great outlines is the plan of the work, which is clear and recommendable; but the reader is confronted with difficulties as soon as he enters into the details of the exposition, and we must confess that in glancing through this book we are more than ever impressed with the desirability of having in psychology definite and commonly accepted terms. The terms "psychic" and "mental" may mean the same, or they may not. Emotions and feelings on the one side, and intellect on the other, are represented as "the obverse and reverse of the same coin." Yet is intellect said to "embrace the entire thinking part of the mind, all of mind that "is not feeling" (p. 225). That which constitutes the nature of thought is not the feeling element of thought; nevertheless, there can be no thought which is not at the same time feeling. Mr. Ward says, "The common expression, unconscious, feeling,' is a "contradiction of terms"; yet he classifies sensations into (1) "pleasurable and painful," (2) "conscious and unconscious" (p. 125). Are not "sensations" included under the head of "feelings," and if there are no unconscious feelings, how can there be unconscious sensations? We should say that "consciousness" is a peculiarly intensified state of feeling and have no objection to speaking of subconscious or dim and even unconscious feelings.

Emotions are characterised as "secondary sensations"; they are "reflected "from the brain along special nerve-fibres to certain specialised emotional ganglia "within the organism," and are said to have their seat in the sympathetic system—a theory that is scarcely tenable on physiological grounds. Schopenhauer, who in spite of his genius was not free from certain metaphysical and telepathic supersti-

tions, was inveigled into holding a similar belief because somnambulists place books, which they pretend to read with closed eyes, upon their stomachs.

The most serious deficiency in the treatment of terms is Mr. Ward's omission of a description of the nature of mind. A definition of mind would, in our opinion, be most indispensable in a psychological sociology, but we can find no allusion to the subject, except that mind is said to be the highest property of matter. And it appears that Mr. Ward regards mind as incapable of explanation, for he adds, when speaking of intellect on page 225, "that any property involves mystery." It is true that we do not know why quinine is bitter, but suppose we knew the molecular constitution of the papillæ on the tongue, and the chemical action of quinine, sugar, vinegar, and other substances upon the papillæ, would it not be probable that we should come to understand why sugar has a sweet and quinine a bitter taste, in the same way as we know why the seventh in a melody produces the sentiment of expectation and unrest, while a return to the keynote is accompanied with a feeling of satisfaction. Certainly we do not as yet know the molecular form which produces sentiency, but we do know that it depends on a peculiar kind of interaction, such as can be observed in protoplasm. Certainly, we cannot say that it is mysterious because all the properties are mysterious. Mysterious though it is at present, the time may come when we shall understand the conditions of sentiency, as well as those of many other properties, for instance, the transparency of glass, which presupposes a molecular arrangement permitting the transmission of ether-waves without disturbance. Now, the nature of mind is by no means mysterious or unknown, nor are we justified in regarding it as a mere "accident" (see p. 89). Mind is the natural and necessary outcome of sentiency. Suppose the world, which in its objective aspect appears as matter moving in space, to be throughout possessed of subjectivity exactly proportionate to the form of its objectivity: will it not necessarily cause mind and intellect to appear in the subjectivity of those combinations which preserve in the flux of their activity the forms of former impressions so as to admit of their revivification. Memory in sentient structures is the condition of mind, and memory is not a mysterious quality: it is the preservation of sentient forms. Mind originates as soon as various revived feelings acquire meaning representing the causes which excited them as external objects.* It is a great pity that Mr. Ward has neglected memory and the paramount importance of the rôle it plays in the production of mind and intellect.

While Mr. L. F. Ward upon the whole shows many influences of Schopenhauer, we cannot say that he is just toward his pessimism. Schopenhauer's pessimism is one of the most powerful philosophies of all ages, and is not merely "the negation of pleasure" (p. 64). We should prefer to characterise it as the doctrine which teaches, on the one hand, the vanity of pleasure, and on the other hand, the inevitableness of pain, thus coming to the conclusion that life is not worth living. Mr.

* See my *Soul of Man*, Chap. I.

L. F. Ward says: "The answer to pessimism comes from psychometry. . . If the "act of gratifying a desire were absolutely instantaneous, there would be no answer "to the pessimist" (p. 65). But "in psychics as in physics no phenomenon can "take place except in time, . . . and the act of satisfying a desire may be consider- "ably prolonged, or in certain cases almost indefinitely continued. . . . In the pri- "mary physical form of satisfying love it is only momentary, in the secondary "spiritual form it seems to be indefinite in time" (p. 68). "What is true of love is "true also of other permanent pleasures and enjoyments. They are real at least to "the subjects of them, and there is every reason to consider them objectively real. "And this is the refutation of pessimism" It is to be feared that this refutation will convert no adherent of Schopenhauer. The reality and relative permanence of happiness does not remove pain, sickness, old age, and death; nor does it dispose of the vanity of pleasure. The truth of pessimism lies too deep to be overcome by Mr. Ward's arguments!

We agree with Mr. Ward that both pessimism and optimism must be abandoned and that meliorism is to be accepted; but the meliorism which we propose is different in one important point from his. James Sully describes George Eliot's meliorism as "a faith which affirms not only our power of lessening evil—this nobody questions—but also our ability to increase the amount of positive good." And Mr. L. F. Ward's meliorism is not an ethical but a dynamic principle. In our opinion a belief in the increase of the amount of good—which can as little be doubted as the lessening of evil—cannot overcome pessimism; for the happiness of the world is thereby not considerably, perhaps not at all, increased. While some evils are lessened, others are increased, and still others originated that did not exist. Happiness depends upon the satisfaction of wants and as every satisfaction begets new wants, the progress of evolution will naturally increase the sensibility to pain at least in the same degree as the pleasures of satisfying our wants. Progress intensifies everything, our happiness and also our misery, and we cannot help considering the belief in a millennium upon earth as an empty dream. We believe that pessimism is irrefutable to him, who, like Mr. L. F. Ward, regards happiness as the aim of man's life (Chap. XIII), and "pain in and of itself as an evil—the only evil" (p. 40). Consider but two of the quotations prefixed to Chap. XI, one by the old Goethe whose life had been one of the happiest on earth, who says, "*ich kann wohl sagen dass ich in meinen fünfundsiebzig Jahren keine vier Wochen eigentliches Behagen gehabt,*" and another from Humboldt's memoirs, "*das grösste Glück ist noch das, als Flachkopf geboren zu sein.*"

There is in our opinion but one escape from pessimism which is Buddha's time-worn and ever new solution of the problem, whose doctrine may briefly be summed up in the injunction "to surrender all thought of self and to walk in the noble path of righteousness." Mr. L. F. Ward's meliorism is only a new formulation of optimism, and the truth of it is, to say the least, very doubtful. The ethical meliorism, however, fully recognises the truth of pessimism and overcomes pessimism by

surrendering from the beginning all those illusions the impermanences of which are complained of. The improvements of a "dynamical meliorism" are good and welcome, but they are of no avail to him who has not as yet understood the vanity of pleasure and the emptiness of a life devoted to the interests of self.

Mr. L. F. Ward makes some good remarks on the function of pain but his inferences go too far. He speaks of "the purpose [sic!] for which feeling was created," which he supposes "to consist of pleasure and pain" (p. 39), repeating the word "purpose" not only on the same and on the following page, but in other passages. He maintains that pleasure and pain are the products of natural selection or of the survival of the fittest, saying:

"Pleasure and pain are the conditions to the existence of plastic organisms, "pleasure leading to those acts which insure nutrition and reproduction, and pain "to those which will insure safety."

Pleasure and pain are undoubtedly important factors in the evolution of the animal world, but the kingdom of plants demonstrates that the existence of plastic organisms with complex systems of nutrition and reproduction and also devices for safety is possible without pleasure and pain. Pleasure and pain have not been created for any purpose or because life would not be possible without them; must we not rather assume that the world consists of potential feeling and that it actually appears in animal plasma?

Mr. L. F. Ward speaks much of an omitted factor which, for lack of a better name, he calls "intuition." Intuition is characterised as an undecomposable mental act, absolutely simple and undifferentiated. He likens primary intuition to protoplasm or the simplest protozoans (p. 274). It is apparently the same as Kant's *Anschauung*, and is by no means an omitted factor in psychology, notwithstanding Mr. L. F. Ward's disclaimer, who says, "I am not aware that Kant has ever applied it to the primary and practical quality of mind here described . . . . it is with him a purely metaphysical conception" (p. 146). Any one who finds in Kant's term *Anschauung* any metaphysical meaning will be sure to misunderstand the fundamental doctrines of his "Critique."*

In the third part Mr. L. F. Ward contrasts what he calls the economics of nature and of mind, the former being based upon the actions of the human animal and the latter upon the actions of the rational man. "The former is the system of the physiocrats, Adam Smith, Ricardo, Malthus, Herbert Spencer, and the modern individualists. The latter was foreshadowed by Auguste Comte but has never taken any systematic shape except in 'Dynamic Sociology,'" a former work of Mr. L. F. Ward's. Mr. Ward here understands by *nature* "all classes of phenomena, whether physical, "vital, or even psychic, into which the intellectual or rational element does not "enter, while the word *mind* will, for the sake of brevity, be employed in the some-"what popular or conventional sense of rational or intellectual, the two terms thus

* See the article "What does Anschauung Mean? in *The Monist*, Vol. II. No. 4, pp. 527-532.

"mutually excluding each other, and taken together covering all possible phenom-"ena." We have our doubts whether the economists of nature, so called, deserve Mr. L. F. Ward's criticism. They were neither blind to the wastefulness of nature in comparison with human foresight nor did they ignore in their systems that social states are constituted by sentient and rational beings. What Mr. Ward does not seem to appreciate is that nature, even in the narrow sense in which he defines it, and mind do not exclude one another, and that natural laws govern even our mental acts, our desires and purposes together with the entire growth of social organisms. The members of a society are all conscious and rational beings; they pursue their aim and make their plans, but they cannot with impunity replace the natural laws governing the social relations by artificial schemes. There is no such contrast between nature and mind as Mr. L. F. Ward seems to assume in his definition; nor are the teleological aspirations of man in any sense a reversal of the natural processes but only a higher and more perfect stage of nature. We cannot artificially devise them but must invent them, for unless they agree with and are based upon the natural laws of the social growth, they will be unavailable.

Mr. L. F. Ward proposes to replace the old systems of society, "autocracy, aristocracy or democracy or even plutocracy," by sociocracy. Democracy is the last phase through which all must pass to reach sociocracy. By sociocracy the author understands a government purely in the interests of society. "All democratic governments are largely party governments"; sociocracy will do away with parties and attend to the business of the people in a business-like way. This, however, does not mean socialism, which Mr. L. F. Ward regards as being based "upon pure theory and *a priori* deductions." He says:

"It is the special characteristic of the form of government that I have called "sociocracy, resting, as it does, directly upon the science of sociology, to investigate "the facts bearing on every subject, not for the purpose of depriving any class of "citizens of the opportunity to benefit themselves, but purely and solely for the "purpose of ascertaining what is for the best interests of society at large."

Mr. L. F. Ward is an author whose literary and personal accomplishments have given him a well deserved prominence all over the States and especially at his home, Washington. His book treats a subject of great importance; and although we cannot agree with many of its most fundamental tenets we recommend its study and cannot but say that it is full of valuable and suggestive thought. P. C.

THE INTRA-CRANIAL CIRCULATION AND ITS RELATION TO THE PHYSIOLOGY OF THE BRAIN. By *James Cappie*, M.D. Edinburgh: James Thin, 54 and 55 South Bridge. 1890. Pp. 188.

"My aim in the following pages," says the author, "has been to give a contri-"bution, on the one hand, to intra-cranial physics, and on the other to mental "physiology." His method might be called the philosophical method, which forestalls, but does not preclude experiment. "I shall not despair to show," he says,

"that by the method I intend to pursue, more light may be thrown on the physiol-
"ogy of the brain than can in the meantime be expected from any analysis of its
"structures, however minute and accurate that may be. . . . The revelations of
"minute anatomy are too frequently only isolated links. They furnish interesting
"facts, rather than the explanation of wider phenomena. They show us instru-
"ments, but not action. . . . No analysis of sea-water would ever explain the flow
"and ebb of the tide; nor will the microscope or test-tube ever explain the flow
"and ebb of consciousness. *Possibly, however, some measure of success may be gainea*
"if we hold the brain, as it were, at arm's length, and take a bird's-eye view of its
"more palpable relations."

With respect to subject, the author's contention is, that *the physiological bearing of the brain's surroundings* has not received in late years the attention it deserves. The cranium has hitherto been regarded simply as an organ of protection. "It is "more than likely, however, that, as I shall afterwards attempt to show, the prop-
"erties of the skull exert a positive influence on the physiological action of the brain
"itself. Then, what indeed appears not a little surprising, is the circumstance that
"*the peculiarities of the encephalic circulation*—so numerous and so striking—now
"receive less attention than they did in the early years of the century. It is with
"some hope of reviving interest in these peculiarities, and to point out certain
"modes in which they can exert an influence on the brain's activity, that I now
"venture to submit the following essays."

Dr. Cappie prefaces his investigation with a few pages upon the philosophy of physical causation, which he considers simply in the physical point of view. In the main he takes the modern scientific view of cause, holding that in the investigation of physical phenomena we must not substitute a general term for facts. For example, the true scientist does not attempt to grapple with an entity *life* but with the conditions which go to constitute something *living*. An example analogous to this which bears upon the chief points of his investigation is that of "sleep." It is frequently stated by physiologists that sleep must be regarded as the cause rather than as the consequence of the so-called cerebral anæmia which obtains in the substance of the brain during repose. But to speak of sleep as a cause is substituting a general term for conditions of fact. Also, "no law, however universal, is the cause of any event." With respect to these points Dr. Cappie is very clear, and no philosophical psychologist will withhold his assent to this position. But if "life," "sleep," etc., cannot be causes, can "energy" be a cause? Dr. Cappie seems to think so, for he says, "energy itself is alone privileged to exercise actual power, and, therefore, sole efficient cause." The objection to this cannot be made too strenuous. Energy is an abstract physical concept, as life is an abstract biological concept. The realities it represents are masses in actual or possible motion, mathematically expressed. It, with matter, is no more the fundamental objective reality (despite Professor Tait's assertion) than is the theological notion of God. If this were seen, Dr. Cappie would not say that energy is mysterious, nor that motion is

something apart from energy. The mystery is the hypostatisation of an abstract idea—viz., energy.

On the question of the correlation of mind and brain also Dr. Cappie is clear, holding, not that the two are identical, but simply that every form of mental activity must have its somatic side. It is, as we have seen, the special question of this book to give prominence to the circulation as one of the essential factors in conditioning the brain's activity. "The blood is to the grey matter of the brain what atmospheric air is to fuel in ordinary combustion." A consideration of the laws of this circulation, says the author, is of first importance in any attempt to take a comprehensive view of the brain's physiology. But on this subject there is a gap in physiological and psychological works. However, the circulation within the skull contrasts so remarkably with that of other parts of the body that the peculiarities presented cannot help possessing some definite physiological significance. Dr. Cappie then devotes a number of pages, adorned by three beautiful plates, to a lucid exposition of intra-cranial circulation, the results of which are that in the brain the quantity of blood is larger in proportion to the size of the organ nourished than in other parts of the body; that the larger arteries communicate with one another more freely here than in other parts; that the circulation of the brain mass is practically capillary; that the larger veins and arteries lie apart from one another; and that the venous blood is transmitted through channels with tough, inelastic walls.

After showing that the circulation of the brain is in part capillary, and that its rapidity varies with the requirements of nutrition, that the mass of blood within the cranium is practically uniform, and that the pressure of the atmosphere upon the contents of the cranium is an important factor, the author comes to the causation of sleep. This is the chief theme of the book. We shall state his hypothesis in his own words. He says: "We have not one or two, but a combination and succession of conditions inseparably linked together. The first change is a modified—a less energetic—movement in the molecules of the brain tissue; the last is compression of the whole organ. From lessened activity of the molecules spring a less active state of the capillary circulation and diminished stress through the cranial cavity. Next, we have a change in the balance of the encephalic circulation, in producing which the weight of the atmosphere, causing backward pressure in the cerebral veins, is an essential agent. The circulation in the brain itself is diminished; its vessels become comparatively empty, and to a corresponding extent the proportion of blood in the veins is increased. With the altered balance of the circulation there is a change in the balance of active pressure; it is less from within and more on the surface; it is less expansive and more compressing. With a certain amount of compression consciousness is suspended." For the full details we must refer the reader to the work itself.

In the eighth section of the book the author considers "how the peculiarities of the encephalic circulation may affect the mode or outcome of functional activity in the brain itself." The immediate seat of any activity must have its vascu-

larity increased, and as a consequence some other portion of the brain must become less vascular. Secondly, a certain amount of pressure must be exerted on the surrounding tissues which will produce a more rapid movement of the blood current. Take attention. In the state of indifference the encephalic circulation will have a certain balance. If an impression is made on some sensory surface of sufficient strength to secure attention, the vascular activity of the part receiving the impression will be increased. So with attention. Its cerebral correlation is the focussing of the encephalic circulation in the direction of the activity, the increased activity of the circulation reacting on the energy of the tissue, thus making the mental effect produced stronger. "The momentum of the circulation is now directed towards "the centres of ideation and voluntary motion, and that implies derivation from "and consequent weakening of functional vigor in the sensory ganglia."

Similar applications are made to explain other familiar phenomena of mental physiology, including hypnotism. His principles, the author states, may also be applied to hysteria and other forms of insanity.

It is not within the province of *The Monist* to pass judgment upon special researches of this character. In the formulation of his problems, and in the clear emphasis of the points at issue, Dr. Cappie's method reminds us of Ribot. Also, with respect to the influence of anatomical characters on physiological and correlatively on psychical action, the idea of the author is related to the remarks of M. Binet, on a different subject, presented in Vol. III, No. 1, and Vol. IV, No. 1, of *The Monist*. But whatever their ultimate worth—which experience, if not experiment, will sometime determine—the reader of Dr. Cappie's work will find his conclusions clearly and undogmatically put, and will not regret the time spent upon its perusal.

THOMAS J. MCCORMACK.

SOCIAL EVOLUTION. By *Benjamin Kidd*. New York and London: Macmillan & Co. 1894. Pp. 348. Price, $2.50.

It is one of the chief results of Mr. Kidd's meditations that the evolution which is slowly proceeding in human society is not primarily intellectual but religious in character. "It would appear," he says, "that when man became a social creature "his progress ceased to be *primarily* in the direction of the development of his in- "tellect. Thenceforward, in the conditions under which natural selection has ope- "rated, his interests as an individual were no longer paramount; they became sub- "ordinate to the distinct and widely different interests of the longer-lived social "organism to which he for the time being belonged. The intellect, of course, con- "tinues to be a most important factor in enabling the system to which the individ- "ual belongs to maintain its place in the rivalry of life; but it is no longer the "prime factor. . . . The race would, in fact, appear to be growing more and more "religious, the winning sections being those in which, *cæteris paribus*, this type of "character is most fully developed."

In speaking of the Utilitarian conception of ethics, which he rejects as incon-

sistent with the teachings of evolutionary science, Mr. Kidd well says that "The "greatest good which the evolutionary forces, operating in society, are working out, "is the good of the social organism as a whole. [But that] *the greatest number in "this sense is comprised of the members of generations yet unborn or unthought of, to "whose interests the existing individuals are absolutely indifferent.*" His own idea of the teaching of evolutionary science as applied to society is "that there is only "one way in which the rationalistic factor in human evolution can be controlled; "namely, through the instrumentality of religious systems. These systems consti- "tute the absolutely characteristic feature of our evolution, the necessary and in- "evitable complement of our reason. It is under the influence of these systems "that the evolution of the race is proceeding; it is in connexion with these systems "that we must study the laws which regulate the character, growth, and decay of "societies and civilisations."

The author disclaims any pretension to treat the subject of the evolution of society "in its relations to that wider field of philosophical inquiry of which it forms a province." This may, perhaps, explain Mr. Kidd's contention that those who aspire after a rational basis for individual conduct in society are in pursuit of something which can never exist. "There can never be," he says, "such a thing as a "rational religion. The essential element in all religious beliefs must apparently "be the *ultra*-rational sanction which they must provide for social conduct. . . . "*No form of belief is capable of functioning as a religion in the evolution of society "which does not provide an ultra-rational sanction for social conduct in the individ- "ual.* In other words: *A rational religion is a scientific impossibility representing "from the nature of the case an inherent contradiction of terms.*"

Mr. Kidd holds this view because of his definition of religion which is: "*A re- "ligion is a form of belief, providing an ultra-rational sanction for that large class "of conduct in the individual where his interests and the interests of the social organ- "ism are antagonistic, and by which the former are rendered subordinate to the latter "in the general interests of the evolution which the race is undergoing.*"

If you say to him, "Here is a religion, scientifically deduced, with no supra-rational sanction," he will answer, 'That religion is not a religion because it is not 'a social phenomenon. It has not proved itself to be a religion. It has not in- 'fluenced and moved large masses of men in the manner of a religion. If you wish 'to accept this system as a religion you may, but you do so merely on the *ipse dixit* 'of a small group of persons who chance so to describe it.'

In a sense this is true. Not every wild scheme of conduct or view of the world is a religion. To be such, it must be proved. But admitting that the proof must be more than individual, it does not necessarily follow that it must be historical. When Buddha reached his solution of the religious question, was it or was it not a religion? According to Mr. Kidd, it was not; but the fact is, it was. Buddha's proof was deduced from the logic of facts, just as the proofs of the scientific schemes of religion, which Mr. Kidd repudiates, claim to be deduced. Whether the deduction

is correct is another question; but at any rate it is a subject of reason. Says Buddha ("Mahâtaṇhâsakhaṃya Sutta, Majjhima Nikâya," Vol. I. p. 265): "If ye now know thus, and see thus, O disciples, will ye then say: We respect the Master, and out of reverence for the Master do we thus speak?"—"That we shall not, O sire." —.... "What ye speak, O disciples, is it not even that which ye have yourselves known, yourselves seen, yourselves realised?"—"It is, sire." Here is a religion without a supra-rational sanction for conduct. And the fact goes to disprove Mr. Kidd's whole theory.* T. J. McC.

PAIN, PLEASURE, AND ÆSTHETICS. An Essay Concerning the Psychology of Pain and Pleasure, with Special Reference to Æsthetics. By *Henry Rutgers Marshall*, M.A. London and New York: Macmillan & Co. 1894. Pp. 359. Price $3.00.

The main idea of this book is to treat æsthetics as a branch of hedonics; art is viewed as a species of pleasure, and artistic enjoyment is defined as that kind of pleasure which is relatively permanent in revival (Chap. III). This classification, simple though it is as stated in its generality, is defended by the author with elaborate circumlocution by investigations into the psychology of the phenomena of pleasure and pain, for which he coins the new word *algedonic*† (derived from ἄλγος and ἡδονή). The first chapter (pp. 1–62) contains a discussion of feeling, emotion, *Gefühl*, *Empfindung*, *sensibilité* in their relation to algedonic phenomena; the theory that "pleasure and pain are qualities of a most general nature, either one of which may, and one of which must, belong to each psychic element which is differentiable" (p. 61) being proposed as a working hypothesis. The fourth and fifth chapters discuss the much mooted problem of the physical basis of pleasure and pain. We read on page 169 (repeated on p. 194), "The activity of the organ of any content if efficient is pleasurable, if inefficient is painful." Efficiency or inefficiency are described as "functions of the relation between activity and nutrition, pleasure being dependent upon the use of surplus stored force and pain upon conditions under which the outcome of the organ's activity is less than should be expected in consideration of the energy involved in the stimulus." This view seems to us wholly inadequate to cover the facts to be explained, but the author not only finds some corroboration of it, but also trusts it "to be in line with the important position maintained in Chapter I, namely that pleasure and pain are general qualities" as stated above. In the second chapter the author protests against identifying the emotions with pleasure and pain phenomena (p. 90 and 94–95), calling the former "representative pleasures and pains" and defining them as "the psychic coincidents of relatively fixed co-ordinated

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*Mr. Kidd says the notion of *Karman* is the ultra-rational sanction of Buddhism, and with this dismisses this religion as fitting in with his theory. But the kernel of the idea of *Karman* is certainly not ultra-rational, unless the theory of heredity and evolution are so.

†*Alghedonic* (to be pronounced "alg-hē-do'nic," not "al-je-donic") would have been more appropriate.

instinctive activities arising upon the appearance of definite objects." The sixth chapter applies the author's theories to what he calls "algedonic æsthetics." Mr. Marshall is aware that "the evidence presented is not crucial," but he is satisfied that "in pushing the theory to its conclusions serious oppositions have not been developed." Nor is it probable that any opposition ever will develop to Mr. Marshall's theories, but we doubt their helpfulness and practical use in the domains of science and art, to the reconciliation of which the work is laudably dedicated. K.

EMPFINDUNG UND BEWUSSTSEIN. Monistische Bedenken von *B. Carneri*. Bonn: Emil Strauss. 1893.

It is Mr. Carneri's purpose in this pamphlet to present to the philosophical world the objections which have arisen in his mind affecting the purity of the modern monistic view of the world. Monism, he claims, is scientifically established; the only problem left is *what kind* of monism must be accepted. Mr. Carneri's "objections" are chiefly levelled against the doctrines which claim that mind is simply a side or aspect of matter, and not a function of it; these doctrines logically imply, he thinks, the existence of a nervous system or organisation in all matter, and also a complete unity of nervous and conscious activity, which is absurd. Mind is not, however, an achievement of matter *per se*, but of matter as a *human organism*.

His position apparently implies (1) materialism and (2) agnosticism. But the first is refuted by the fact that in the idealistic view all matter is a simple notion of the mind; and with respect to the second (we quote from a private letter on this subject from the author to the editor of *The Monist*), Mr. Carneri says he will not accept the appellation of "Agnostic," unless he is forced to do so. He does not regard himself as one. He has a very exalted conception of knowledge, which to him is paramount to all, and he says with Kant that it is absolutely incalculable how far man can still penetrate into the secrets of nature. What Mr. Carneri, with Kant, does not regard as belonging in the sphere of human knowledge, because surpassing experience, is the "thing-in-itself" in all its protean aspects. True, he does not use the term "thing-in-itself," and regards it as unfortunate that Kant brought the term into circulation, because it can be, and is, very easily understood, for example by Schopenhauer, as something which has a peculiar essence of its own. Mr. Carneri admits that if he used the expression in this sense one would have every reason for charging him with dualism. But Kant did not understand the expression in this sense, and even characterised this idea of it as a bugbear of the intellect. Things, Mr. Carneri maintains, are simply complexes of sensations. What he calls the "in-itself-existence" of things is that which the things would be if we conceived them severed from our sensations. But of what this is we can acquire no knowledge since it transcends all possible experience, in so far as our experience and with it our knowledge in the last instance leads us back to our sense-activity as to *our own* sensation. With Kant, Mr. Carneri invests things with materiality as a fundamental attribute, while he also classes himself (his feeling) among things. He

ascribes to matter those qualities which all things have in common and which he feels they have. He must assume matter, since otherwise all things, including himself, would be naught, or at best mere ideas, such as Berkeley constructed. What he knows of matter, he knows only through his sensation, and for that very reason he cannot know what matter in itself can be, that is, matter severed from sensation. If this is a subject of knowledge—which he cannot grant, then, and then only, is he an agnostic.

With respect to the religious outcome of his doctrines, we may say that though Mr. Carneri recognises the Religion of Science as a product of perfect correctness of thought, and as the only religion that does not conflict with the present state of our knowledge, yet he thinks that for that very reason the religious element in it is a so exalted one that the religious minds who are satisfied with it must be in the highest sense of the word *élite* human beings. Mr. Carneri admits the statement that man consists of his ideas, his influences, and his aspirations. It depends, therefore, upon *the idea of immortality* which one possesses whether one can be satisfied with the idea of immortality of this religion. Personally, Mr. Carneri has no need of religion or immortality whatsoever, and is so reconciled to the belief that his personality will wholly cease with death that it is to him a blissful certainty. It is a source of real delight to him, he says, and an encouragement to good deeds, to be able to think that some of his achievements will continue after his death to have a beneficent influence on others, in no matter how insignificant a way. But his personality, which will then no longer exist, will have as little share of these as he should have, in his present life, of freedom or property, if he should be robbed of these and others should enjoy them in his place.

These remarks will indicate the general drift of Mr. Carneri's doctrines. *μ.*

INTRODUCTION A LA PSYCHOLOGIE EXPÉRIMENTALE. By *Alfred Binet*. Paris: Felix Alcan. 1894. Pp., 146. Price, fr. 2.50.

There has long been a lack in English of a practical treatise of experimental psychology, and although we notice that two are in preparation—one from the pen of Professor Cattell,—the student, until the appearance of these, may be referred to the present easily-read French work of M. Binet as the best accessible manual of the subject. The volume is a collaboration in a certain measure, parts of it having been written by M. Phillippe, M. Courtier, and M. Victor Henri. Its descriptions refer chiefly to the psychological laboratory of Paris, which is attached to the École des Hautes-Études, and to the psychological laboratories of Germany. M. Binet does not profess to know much about the organisation of the numerous laboratories of America, but his ignorance does not diminish the worth of his instructions, as the methods of this study must be essentially the same in all parts of the world. M. Binet mentions the existence of psychological laboratories at two American cities, Medissona and Chompen,* of which we have never heard. Chapter

[1] Probably Madison, Wis., and Champaign, Ill.

I is devoted to the laboratories of psychology; Chapter II treats of Psychological Methods; Chapter III of Sensations, Perceptions, and Attention; Chapter IV of Movements and Will; Chapter V of Memory; Chapter VI of Ideation; Chapter VII of Psychometry; Chapter VIII of Methods of Observation and of Interrogatories. There is a description in the book of Hipp's chronoscope, which even Külpe's work lacks, as also of the common methods of registration and of the other stereotyped procedures. "Experimental psychology," M. Binet says, "is autono-"mous and has been definitively organised into a distinct and independent science. "It is independent of metaphysics, but it does not exclude all metaphysical results. "It supposes no particular solution of the great problems of life and of the soul. It "has no special drift, spiritualistic, materialistic, monistic, or otherwise; it is a "natural science, and nothing more." *μ.*

THE CIVILISATION OF CHRISTENDOM AND OTHER STUDIES. By *Bernard Bosanquet.* London: Swan Sonnenschein & Co. 1893. Pp., 383. Price, $1.50.

The Ethical Library, of which this book is the first number "is not," its editor says, "a new 'Science Series.' It will not contain books on moral science properly so called. The chief results of the modern study of mind and morals will for the most part be assumed without scientific demonstration. The guarantee to the public that the underlying principles are not *mere* assumption or isolated *aperçus* must be the names of the writers themselves, who, it is hoped, will be recognised as specialists in particular departments of mental and moral philosophy." Other volumes in this library have been promised by Prof. Henry Sidgwick, Mr. Leslie Stephen, Mr. D. G. Ritchie, Mrs. Sophie Bryant, and the Editor, J. H. Muirhead. Mr. Bosanquet's book is a collection of addresses delivered by him before various English societies, and of essays recently published in ethical periodicals. Their titles are as follows: "Future of Religious Observance"; "Some Thoughts on the Transition from Paganism to Christianity"; "The Civilisation of Christendom"; "Old Problems under New Names"; "Are we Agnostics?"; "The Communication of Moral Ideas as a Function of an Ethical Society"; "Right and Wrong in Feeling"; "Training in Enjoyment"; "Luxury and Refinement"; "The Antithesis Between Individualism and Socialism Philosophically Considered"; "Liberty and Legislation." Our readers will derive pleasure and profit from the perusal of these essays of Mr. Bosanquet, who has here expressed his opinions upon some important ethical and social topics with much grace and art. *μ.*

DIE PHILOSOPHIE DES NICOLAUS MALEBRANCHE. By *Dr. Mario Novaro.* Berlin: Mayer & Müller. 1893.

This little book (107 pages) is a clear and enthusiastic presentation of the philosophy of Malebranche, a subject on which Dr. Novaro has also written in Italian. Bruno, not Bacon, nor Descartes, claims Dr. Novaro, is the father of modern philosophy; it is he who pointed out the true paths which modern philosophy, and in

fact all philosophy, must follow. But Bruno's position is an ideal one. He found no worthy son, either at home or abroad. Bacon exercised little influence either on continental or on English philosophy, and his position in the world of thought is much overestimated. Neither Locke, Berkeley, nor Hume, are followers of Bacon, but rather of Hobbes, Descartes, and Malebranche. The greatest influence on Continental and English philosophy before Kant was unquestionably exercised by Descartes and Malebranche. But Descartes never fully elaborated or systematised his philosophy. It was left to Malebranche to construct from the Cartesian fragments a universal and harmonious system. Before Kant there are but three systems of modern philosophy: that of Hobbes, that of Bruno and Spinoza, and that of Malebranche.

This is Dr. Novaro's view of the trend of modern philosophy. The book is written in a very pleasant style; its author shows a wide acquaintance with the philosophical literature of all European nations and puts both the character and thought of Malebranche in a very clear light, correcting many errors which are current with respect to this philosopher, and not omitting to present just criticisms of his views. The philosophy of Malebranche, says Dr. Novaro, is a magnificent and consistent system if we admit its fundamental premise—the identity of thought and being. But this premise is contested. μκρκ.

STOICS AND SAINTS. Lectures on the Later Heathen Moralists, and on some of the Aspects of the Life of the Mediæval Church. By the late *James Baldwin Brown*, B. A., Minister of Brixton Independent Church. London and New York: Macmillan & Co. 1893. Pp. 296. Price, $2.50.

The subjects of the ten lectures which constitute this volume are as follows: "The Later Age of Greek Philosophy and the Epicurean and Stoic Schools"; "Epictetus and the Last Effort of the Heathen Philosophy"; "Marcus Aurelius, and the Approximation of the Heathen to the Christian Schools"; "Why Could not the Stoic Regenerate Society?"; "The Monastic System, and Its Relation to the Life of the Church"; "St. Bernard, the Monastic Saint"; "St. Thomas of Canterbury,—the Saint as Ecclesiastical Statesman"; "St. Francis of Assisi, and the Rise of the Mendicant Orders"; "St. Louis of France,—the Saint in Secular Life"; "John Wyclif, and the Dawn of the Reformation." The lectures were delivered at various times and at various places during the later years of Mr. Baldwin Brown's life, and are now published at the desire of many who heard them, with but slight alteration. They make no pretensions to systematic historical exposition. μ.

WISSEN UND GLAUBEN. By *Dr. C. Güttler*. Munich: C. H. Beck. 1893.

The point of view of this work is the point of view of faith. The author, a Privatdocent in the University of Munich, characterises his position as comparative eirenics. With regard to knowledge, in so far as it is human scientific knowledge,

Dr. Güttler seems to be slightly agnostic. Also, he believes that the biblical account of creation is reconcilable in its main outlines with the Darwinian theory of evolution, and his idea of immortality, although it rejects the notion of heaven as an idealistic earth is still that of a "linear continuation of personality," in which the animal soul does not share, because the animal does not possess ideals, does not exhibit mental progress or uninterrupted causal connexion of mind, in other words, does not possess civilisation. This argument seems to support the idea of immortality in the race only. But the author does not stop at his philosophical conclusion but continues and claims with St. John, xi, 25, "I am the resurrection and the life," and so forth. μκρκ.

ZUR VERJÜNGUNG DER PHILOSOPHIE. Psychologisch-kritische Untersuchungen auf dem Gebiet des menschlichen Wissens. By *I. Segall-Socoliu.* Erste Reihe: Das Wissen vom spezifisch Menschlichen. Berlin: Carl Duncker. 1893.

So far as we can infer from a production which lacks a preface and introduction, this book is the Prolegomena of the *first* of a series of philosophical works, planned to appear in three groups. The first series or group treats of the knowledge "of the specifically human"; it will be concluded by a volume, perhaps by more than one volume, on the "Psychology of Philosophising," which is the relative final aim of the past evolution of the world: *Tantum scimus, quantum sumus; quantum scimus, tantum sumus.* The second series will treat of the psychology of social development; the third, of our knowledge of "the universally physical." The Prolegomena are a collection of critical remarks on the chief questions of philosophy. Both in the psychical and physical domain the author arrives at a so-called principle of "unity in diversity," or rather of "unity in *separateness*"; mother and child are one, sun and earth are one, earth and moon are one; unity in separateness is the basis of all action; this is given off from, or emanates from, that: the aim and purpose, therefore, of action in life is that this unity shall be reattained; things and action have thus an affinity with their origin, which affinity bears within it an aim,—the aim of re-unification. Those who read this work will at least be stimulated to *hard* thought on the subjects of which it treats; but the form in which its ideas are put is a rigid and not inviting one. The author is a Roumanian. μκρκ.

THE ETHICS OF SERVICE. By *Frank Sewall, M. A.* London: James Speirs, 36 Bloomsbury Street. 1888. Pp. 32.

This clearly written and elegantly got up pamphlet was read as an essay before the Ruskin "Society of the Rose" in Glasgow, 1888. The power of the universe which compels conformity with natural law on penalty of misery and death, variously termed God, Nature, etc., looked at in the universal aspect of a law of good, is defined by the author as the law of Use, the divine end of the universe put into effect, the law of Service, but of mutual service and not of the service of self. Ethics is the development of the will into harmony with the moral environment which is an

actual objective force operating in the universe by virtue of a Creator and this Creator's purpose, which is the living for other than self, and hence for *mutual service.* The moral law of use or service is thus of divine origin. The theory of the author is that of nearly all logical religions and philosophies, only expressed under different similes and with especial reference to Ruskin. μκρκ.

RELIGION. By *G. de Molinari.* Translated from the second (enlarged) edition, with the author's sanction, by Walter K. Firminger. London: Swan Sonnenschein & Co. New York: Macmillan & Co. 1894. Price 2s. 6d. Pp. 195.

Under the attractive title of the "Philosophy at Home Series" the Messrs. Swan Sonnenschein & Co. have recently published some essays of Schopenhauer's, Lotze's "Outlines of the Philosophy of Religion," E. B. Bax's "The Problem of Reality," Mr. Salter's "First Steps in Philosophy," and A. Lillie's "The Influence of Buddhism on Primitive Christianity." The last number of the series is the present volume of G. de Molinari, who is editor-in-chief of the *Journal des Economistes,* and is well known for his studies of economics. This book is substantially "a plea in favor of the independence and liberty of creeds." M. Molinari, believing that moral forces are the necessary conditions of the prosperity and existence of nations, thinks that religious culture should be freed from material obstacles of all kinds, especially state-conferred privileges and subsidies. The point of view of the work is mainly economical and applies more to the state of things in Europe, where Established Churches exist, than to America. μκρκ.

FRIEDRICH HEINRICH JACOBI, A STUDY IN THE ORIGIN OF GERMAN REALISM. By *Norman Wilde,* Ph. D. Department of Philosophy and Education, Columbia College, New York. May, 1894. Pp., 77. Price, 60 cents.

Mr. Wilde's little book is welcome, as few studies of Jacobi exist in English. Mr. Wilde finds, that although the influence which Jacobi indirectly exercised over Fries, Schleiermacher, and Beneke was great, yet it is rather in the impulse which he gave to the study of psychology that his lasting worth must be recognised. "It "is Jacobi's merit to have recalled philosophy to the study of the inner life. By "insisting on the value of primary beliefs as the ultimate criteria of truth, he makes "necessary the minute study of these facts, and the consequent analysis of con-"sciousness." The pamphlet is the first of the "Columbia College Contributions to Philosophy, Psychology, and Education," which are to appear under the editorship of Professors Butler and Cattell and Doctors Hyslop and Farrand. The series will contain important dissertations submitted for the attainment of the degree of Doctor of Philosophy, technical studies by the professors and instructors, and reprints of contributions made by Columbia men to other journals. The series deserves the consideration and support of philosophical specialists. μ.

DISCUSSIONS.

To the Editor of The Monist:

In the October number of *The Monist*, in an article on "Heredity versus Evolution," by Mr. Theodore Gilman, there occur the following sentences:

"Ribot defines its meaning [that is, of heredity] as 'that biological law by "which all beings endowed with life tend to repeat themselves in their descendants. "It is for the species, what personal identity is for the individual.' Herbert Spen-"cer, carefully following Ribot, defines it as 'the law that each plant or animal "produces others of a like kind with itself.'"

The facts are that the definition of heredity above quoted from Mr. Spencer occurs in the first volume of his "Principles of Biology," § 80, published in 1864. The volume of M. Ribot quoted from,—"L'Hérédité"—was not published until 1873. Obviously, therefore, if there is any indebtedness shown, it cannot be due to the careful "following" of Ribot by Mr. Spencer.

I respectfully send you this note for the next number of *The Monist* in the interest of the commendable exactness referred to by Mr. Gilman in the note printed with his article.

JAMES A. SKILTON.
Corresponding Secretary Brooklyn Ethical Association.

To the Editor of The Monist:

Mr. James A. Skilton, Corresponding Secretary of the Brooklyn Ethical Association, calls attention to a mistake in my article on "Heredity versus Evolution," in *The Monist* of October, 1893, where I say that Herbert Spencer carefully follows Ribot in his definition of heredity, whereas Ribot wrote after and quoted from Spencer.

I had in mind the derivation of the word from the French. My complaint was that Spencer should have been the first to transfer into the English language an important word from the French, where it had been used since the eleventh century, with no comment or explanation, and with a tacit assumption of its acceptance. Since he is silent on the subject of its derivation, he leaves it to others to speculate regarding it.

That Spencer borrowed the word from the French must be accepted as certain. That it came from Lucas (1847) would appear equally so, both because he was the first writer on this special subject, and from his definition "natural heredity, in the "spirit of our definition, embraces the propagation of the forms and elements of "the existence of living beings." This is elaborated in numerous other passages throughout his work.

We may make the same excuse for Mr. Spencer that Professor Weismann does on page 53, Vol. II, of his "Essays on Heredity," where he says: "This hypoth-"esis must have been forgotten later on, or Herbert Spencer would never have "enunciated it and supported it without reference to his predecessors." There is a poetic justice in the fact that the word heredity, which he introduced in this surreptitious manner, should prove a petard, and develop such explosive qualities in connexion with the corner-stone of his entire system.

THEODORE GILMAN.

PERIODICALS.

THE PSYCHOLOGICAL REVIEW. VOL. I. NO. 3.

FREEDOM AND PSYCHO-GENESIS. By *Alexander T. Ormond.*—THE CASE OF JOHN BUNYAN (III). By *Josiah Royce.*—A STUDY OF FEAR AS PRIMITIVE EMOTION. By *Hiram M. Stanley.*—EXPERIMENTS IN SPACE PERCEPTION (I). By *James H. Hyslop.*—PERSONALITY-SUGGESTION. By *J. Mark Baldwin.*—SHORTER CONTRIBUTIONS, DISCUSSION, ETC.—(New York and London: Macmillan & Co.)

The book notices and résumés of technical articles in *The Psychological Review* are good and discriminate. Professor Ormond's article is quite forcible: freedom is teleologically construed, but freedom and self-activity are identified. The result of Professor Stanley's investigation is, "that fear, as indeed every emotion, does not consist of pain or cognition-revivals in any form, but is a feeling reaction from the representation of the feeling potency of the object." Dr. Hyslop's experiments are not yet concluded.

THE PHILOSOPHICAL REVIEW. Vol. III. Nos. 2 and 3.

SOME ANOMALIES IN LOGIC. By *Dr. James H. Hyslop.*—THE THEISTIC ARGUMENT OF SAINT THOMAS. By *Brother Chrysostom.*—GREEN AND HIS CRITICS. By *Prof. H. Haldar.*—GERMAN KANTIAN BIBLIOGRAPHY. By *Dr. Erich Adickes.*

THE TEST OF BELIEF. By *Prof. J. P. Gordy.*—ARE WE "CONSCIOUS AUTOMATA"? By *Prof. James Seth.*—KANT'S RELATION TO UTILITARIANISM. By *Norman Wilde.*—GERMAN KANTIAN BIBLIOGRAPHY. By *Dr. Erich Adickes.* DISCUSSION: THE EGO AS CAUSE. By *Prof. John Dewey.*—BOOK REVIEWS. (Boston, New York, Chicago: Ginn & Co.)

MIND. NEW SERIES, No. 10.

ON THE NATURE OF ÆSTHETIC EMOTION. By *Bernard Bosanquet.*—FREEDOM, RESPONSIBILITY, AND PUNISHMENT. By *James H. Hyslop.*—TIME AND THE HEGELIAN DIALECTIC. By *J. Ellis McTaggart.*—REFLECTIVE CONSCIOUSNESS. By *Shadworth H. Hodgson.*—DISCUSSIONS, ETC. (London and Edinburgh: Williams & Norgate.)

INTERNATIONAL JOURNAL OF ETHICS. Vol. IV. No. 3.

SOME REMARKS ON PUNISHMENT. By *F. H. Bradley.*—OCCULT COMPENSATION. By *Henry C. Lea.*—THE REALITY OF THE GENERAL WILL. By *Bernard Bosanquet.*—THE COMBINATION OF CAPITAL. By *E. Benj. Andrews.*—RELA-

TION OF ETHICAL CULTURE TO RELIGION AND PHILOSOPHY. By *Frederic Harrison* and *Felix Adler*.—"ITALY AND THE PAPACY." By *Francis Archb. Satolli*.—DISCUSSIONS.—BOOK REVIEWS. (Philadelphia: International Journal of Ethics, 118 S. Twelfth Street.)

Professor Adler attempts to reply in this number to the strictures of Mr. Frederic Harrison made in the paper which was read from the great Positivist at the Ethical Congress at Chicago. Mr. Harrison's position, which is well known, is that "the religious and the philosophical problems are really antecedent—must come first; these problems are truly the basis: they govern and determine the ethical problem"; while Professor Adler, whose position is also well known, contends that no previous agreement with respect to religion and philosophy is necessary for members of the ethical societies beyond the desire to increase the knowledge of the right, and that on the simpler, every-day questions of morality a substantial agreement has been reached among good people generally—statements which are very doubtful.

THE JOURNAL OF SPECULATIVE PHILOSOPHY. Vol. XXII. No. 4.

BAUMGART'S INTERPRETATION OF GOETHE'S MÄRCHEN. By *Isaac N. Judson*.—THE SECRET OF KANT. By *Gordon Clark*.—MYSTIC THEOLOGY BY DIONYSIUS AREOPAGITA. By *Thomas Davidson*.—FRIENDSHIP. By *Lenora B. Halsted*.—ARISTOTLE'S DOCTRINE OF REASON. By *W. T. Harris*.—A GLIMPSE INTO PLATO. By *Florence James Williams*.—KNOWLEDGE AND BELIEF REGARDING IMMORTALITY. By *W. Lutoslawski*. (New York: D. Appleton & Co.)

This is the first number of the *Journal of Speculative Philosophy* which has appeared since September, 1892.

VIERTELJAHRSSCHRIFT FÜR WISSENSCHAFTLICHE PHILOSOPHIE. Vol. XVIII. No. 2.

BEMERKUNGEN ZUM BEGRIFF DES GEGENSTANDES DER PSYCHOLOGIE. (First Article.) By *R. Avenarius*.—GLAUBE UND URTHEIL. By *W. Jerusalem*.—EINIGES ZUR GRUNDLEGUNG DER SITTENLEHRE. (Third Article. Concluded.) By *J. Petzoldt*. (Leipsic: O. R. Reisland.)

PHILOSOPHISCHE MONATSHEFTE. Vol. XXX. Nos. 1 and 2.

DIE NATÜRLICHE WELTANSICHT. By *W. Schuppe*.—THEORIE DER TYPEN-EINTHEILUNGEN. By *B. Erdmann*.—IN SACHEN DER TRIEBLEHRE. By *J. Duboc*.—EIN BISHER NOCH UNENTDECKTER ZUSAMMENHANG KANTS MIT SCHILLER. By *K. Vorländer*.—RECENSIONEN. (Berlin: Georg Reimer.)

After October 1, the *Philosophische Monatshefte*, then ending their thirtieth year, will be amalgamated with the *Archiv für Geschichte der Philosophie*, to form a composite magazine that will treat collectively of systematic and historical philosophy, and will bear the title of *Archiv für Philosophie*. The *Archiv für Geschichte der Philosophie* will be conducted as before and bear the same name. The *Philosophische Monatshefte*, which will cover the systematic department, will have the title *Archiv für systematische Philosophie*. A noteworthy feature of this branch of the new magazine will be the annual reports of the philosophical literature of all countries written in the languages of those countries. Also contributions in English, French, and Italian will be received. The reports will be furnished by Prof. Paul Natorp for epistemology, Prof. Rudolph Eucken for metaphysics, Prof. Benno

Erdmann for psychology, Prof. Aloys Riehl for logic, Prof. Friedrich Jodl for ethics, Prof. Ferdinand Tönnies for sociology, Prof. Rudolf Stammler for philosophy of law, Prof. Theodor Lipps for æsthetics, Prof. August Baur for the philosophy of religion, and Prof. Dr. Theobald Ziegler for pedagogics. The editors are: Hermann Diels, Wilhelm Dilthey, Benno Erdmann, Paul Natorp, Christoph Sigwart, Ludwig Stein, and Eduard Zeller.

ZEITSCHRIFT FÜR PSYCHOLOGIE UND PHYSIOLOGIE DER SINNESORGANE. Vol. VII. Nos. 1.

FUNKTION UND FUNKTIONSENTWICKELUNG DER BOGENGÄNGE. By *Karl L. Schaefer*.—DER UMFANG DES GEHÖRS IN DEN VERSCHIEDENEN LEBENSJAHREN. By *Dr. H. Zwaardemaker*.—STUDIE ZUR ERKLÄRUNG GEWISSER SCHEINBEWEGUNGEN. By *Dr. Julius Hoppe*.—LITTERATURBERICHT. (Hamburg and Leipsic: Leopold Voss.)

ZEITSCHRIFT FÜR PHILOSOPHIE UND PHILOSOPHISCHE KRITIK Vol. CIV. No. 1.

UEBER DIE LETZTEN FRAGEN DER ERKENNTNISTHEORIE UND DEN GEGENSATZ DES TRANSCENDENTALEN IDEALISMUS UND REALISMUS. (Second Article.) By *Dr. Edm. Koenig*.—DIE PHILOSOPHIE IN RUSSLAND. By *Jakob Kolubowsky*.—JAHRESBERICHT ÜBER ERSCHEINUNGEN DER ANGLO-AMERIKANISCHEN LITTERATUR AUS DER ZEIT VON 1891–1892. By *Friedrich Jodl*.—RECENSIONEN. (Leipsic: C. E. M. Pfeffer.)

REVUE PHILOSOPHIQUE. Vol. XIX. Nos. 3, 4, and 5.

RECHERCHES SUR LES RAPPORTS DE LA SENSIBILITÉ ET DE L'ÉMOTION. By *P. Sollier*.—LA SANCTION MORALE. By *F. Paulhan*.—DEUX NOUVEAUX HISTORIENS DE DESCARTES. By *F. Bouillier*.

L'ANCIENNE ET LES NOUVELLES GÉOMÉTRIES. II. LES NOUVELLES GÉOMÉTRIES ONT LEUR POINT D'ATTACHE DANS LA GÉOMÉTRIE EUCLIDIENNE. By *J. Delbœuf*.—LE PROBLÈME DU MONISME DANS LA PHILOSOPHIE DU TEMPS PRÉSENT. By *E. de Roberty*.—LA SANCTION MORALE. (Concluded.) By *F. Paulhan*.

LES RÈGLES DE LA MÉTHODE SOCIOLOGIQUE. (First Article.) By *Durkheim*.—LE SENTIMENT ET L'ANALYSE. By *Rauh*.—SUR DIVERSES ACCEPTIONS DU MOT LOI DANS LES SCIENCES ET EN MÉTAPHYSIQUE. By *L. Weber*.—DESCARTES ET LES DOCTRINES CONTEMPORAINES By *A. Fouillée*. (Paris: Félix Alcan.)

In the March number, M. Paulhan gives us an interesting review of M. Durand's work *Le merveilleux scientifique*, and M. Bouillier subjects to a critical examination the views of two new historians of Descartes, M. Brunetière and M. Fouillée. In the April number M. Delbœuf continues the interesting series on the New and Old Geometries. His essays are deserving of special attention at the hands of philosophers.

REVUE DE MÉTAPHYSIQUE ET DE MORALE. Vol. II. No. 2

LA DIVISIBILITÉ DANS LA GRANDEUR: GRANDEUR ET NOMBRE. By *F. Evellin*.—LA VALEUR POSITIVE DE LA PSYCHOLOGIE. By *G. Remacle*.—DEUXIÈME DIALOGUE PHILOSOPHIQUE ENTRE EUDOXE ET ARISTE. By *Criton*.—DISCUSSIONS. (Paris: Librairie Hachette & Co.)

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THE MONIST

A QUARTERLY MAGAZINE.

Editor: DR. PAUL CARUS. *Associates:* EDWARD C. HEGELER. MARY CARUS.

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CHICAGO:

THE OPEN COURT PUBLISHING CO.

London: WATTS & CO., 17 Johnson's Court, Fleet St. E. C.

Price, 50 cts.; Yearly, $2.00. In England and U. P. U., 2s 6d; Yearly, 9s 6d.

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THE MONIST.

A Quarterly Magazine of Philosophy, Religion, Science, and Sociology

PUBLISHED BY

THE OPEN COURT PUBLISHING COMPANY,

MONON BUILDING, 324 DEARBORN STREET, CHICAGO, ILL.

POST OFFICE DRAWER F.

AGENTS AND TERMS OF SUBSCRIPTION.

LONDON: Watts & Co., 17 Johnson's Court, Fleet St., E. C.	Single Copies, 2s. 6d.	Yearly, 9s. 6d.
PARIS: Brentano's, 17 Avenue de l'Opera	fr. 3	fr. 12
LEIPSIC.	Mk. 2.50	Mk. 9.50
ROTTERDAM: H. A. Kramers & Son	——	Fl. 6.60
TURIN: PALERMO: Libreria Carlo Clausen	——	Lire 12
NEW YORK: WASHINGTON: Brentano's, 5 Union Square 1015 Pennsylvania Ave.	50 cents	$2.00
BOSTON: Damrell & Upham, 283 Washington St.		

Postpaid to New South Wales, Victoria, Queensland, Tasmania and New Zealand, and all countries in U. P. U., for one year, $2.25.

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